

**Forming Post-Compulsory Subject  
Choices In School: ~~A Longitudinal Study Of~~  
~~Changes In Secondary School Students' Ideas, With Particular~~  
~~Reference To Choice About Science.~~**

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## **Abstract**

The research in this thesis examined the basis of young people's decision making. A longitudinal study involving periodic interviews addressed questions about how changes in secondary school students' ideas led to decisions about elective education by individuals in mid-adolescence, particularly with reference to science.

Analysis of interview data captured changes in students' ideas over time and a new way of looking at post-16 choice was developed that gives a more in-depth picture of how students' ideas are formed than has hitherto been achieved. The ways in which students' educational objectives were driven by different ideas and the ways in which students engaged with influences on decision-making were used to develop a typology of choice trajectories. The typology unearths variations in the temporal characteristics of young people's thinking about choice.

Five types of choice trajectory were identified. Students with a 'directed' trajectory had a demonstrably stable commitment to a specific career direction inspired by a critical influence at an early age. The 'partially resolved' trajectory was that of a student with identifiable vocational leanings prompted by positive dispositions towards some school subjects and related careers. The 'funnelling identifier' trajectory was shaped by a gradual identification with a domain of interest whereas that of 'multiple projection' was characterised by favouring different careers at different times. The student with a 'precipitating' trajectory lacked critical influences, had diffuse ideas and aimed for broad and versatile choices. Application of the typology to four portraits of students who chose science demonstrated that science was chosen in a variety of ways.

In conclusion, the thesis raises issues for discussion about the impact of choice support mechanisms in schools, particularly in relation to careers guidance and within science teaching.

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## **DEDICATION**

**THROUGH THICK AND THIN  
TO MICHAEL WITH LOVE**



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## **GLOSSARY OF TERMS**

<b>A-Level</b>	Advanced level examination of the General Certificate of Education (England and Wales)
<b>ASE</b>	Association for Science Education
<b>BEES</b>	Biochemical Engineering Education Scheme
<b>BTEC</b>	British Technical Education Council
<b>BERA</b>	British Educational Research Association
<b>CACP</b>	Computer Assisted Careers Programme. A searchable database of different careers.
<b>Careers education and guidance</b>	A programme of activities for students to improve career decision-making skills, including lessons, access to careers database, individual interviews and work experience
<b>CCED</b>	City Council Education Department
<b>Core subjects</b>	The core subjects in the National Curriculum are English, maths and science
<b>DES</b>	Department of Education and Science
<b>DfE</b>	Department for Education
<b>DfEE</b>	Department for Education and Employment
<b>DFES</b>	Department for Education and Skills
<b>Double science</b>	A programme of science including physics chemistry and biology for which two GCSE subjects may be awarded.
<b>GCSE</b>	General Certificate of Education. Examination usually taken at 16.
<b>GIST</b>	Girls Into Science and Technology
<b>GNVQ</b>	General National Vocational Qualification
<b>KS3</b>	Key Stage 3. Secondary education for 11 to 14 year olds, from year 7 to year 9.
<b>KS4</b>	Key Stage 4. Secondary Education for 14 to 16 year olds in years 10 and 11.
<b>NICEC</b>	National Institute for Careers Education and Counselling
<b>NFER</b>	National Foundation for Educational Research

<b>OFSTED</b>	Office For Standards in Education
<b>PSHE</b>	Personal Social and Health Education
<b>SAT</b>	Standard Attainment Tests and Tasks: nationally set tests taken by pupils at ages 7,11 and 14.
<b>SCRE</b>	Scottish Council for Research in Education
<b>SCAA</b>	Schools Curriculum and Assessment Authority
<b>SISS</b>	Second International Science Survey
<b>SISCON</b>	Science in a Social Context
<b>SSCR</b>	School Science Curriculum Review
<b>UCAS</b>	Universities and Colleges Admissions Service

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# Chapter 1. Introduction

At the centre of this thesis are secondary school students who are choosing the next step after school. These young people stand at the interface between school and the post-compulsory phase of education. How students' ideas about post-16 choices are shaped during the last three years of secondary schooling is presented as the central question. To attempt to answer this question the research reported here examined the ideas and influences that shaped students' decision-making over time and revealed a picture of students' positioning with respect to choice which was more detailed than earlier studies and accounts.

The original impetus for the research came from my role as an educator with responsibilities in the personal and social education programme of 14 to 16 year old students in years 10 and 11 of school. I became interested in the way that 16 year olds make choices about post-statutory education and curious as to how their ideas were formed. As a science educator, my particular focus of interest was on the way that students make decisions about science. As well as personal concerns about students' interest in science, there has been national disquiet about science uptake when science subjects were no longer a compulsory part of a student's education. A concern about the drop in numbers of students choosing post-16 sciences has been expressed in connection with the scientific literacy of the nation and the health of the economy.

A preliminary examination of the literature revealed that researchers have usually concentrated on one or two issues at a time giving a fragmented picture of factors that affect student decision-making. Choice processes, the logistics of choice, attitudes to school subjects and adolescent development in relation to choice have been studied. Researchers undertaking longitudinal research have treated students as a homogenous group and other researchers who have researched attitudes have usually failed to include a temporal aspect. I found that research about the way in which choices were made, both generally and particularly with regard to sciences, was limited in scope; I therefore sought to

undertake a study that shifted the focus from attitudes to the way that students characterise the processes through which choices are made.

The second chapter shows how the thesis is framed by the debate about students' post-16 uptake of sciences. Despite the compulsory nature of science, concern about post-16 uptake has been expressed in political and academic quarters. The literature indicates that the contention that the uptake of sciences needs to be promoted has been both supported and challenged. From a political point of view the balance of subjects should be determined by demand and the Dearing report\* made no specific recommendation to promote the uptake of sciences (Dearing, 1997). Therefore, the in-depth examination of choice-patterning that I have undertaken in this thesis aimed to illuminate the students' views of how they make post-16 decisions, to clarify what students understand by 'informed' and to give deeper insight into the basis upon which their future study of science was chosen or dismissed.

Attitudes to science have been particularly interesting to researchers since 1985 when it was introduced as a compulsory subject for all children from the ages of 5-16, joining mathematics and English in the core curriculum for schools in England and Wales (DES, 1985). In the upper secondary school about 20% of curriculum time is devoted to science and questions are raised about how students see the relevance and importance of science. Research into students' ideas about science (Head, 1997) has, in a similar way to research about choice generally (Stables, 1996), usually implied a causal connection between certain attitudes and the choices that students make. When researchers investigate the factors that motivate students to choose science, a reductionist approach is often employed. A student is more likely to have a positive attitude to science, for example, if a parent or close relative is a scientist. Those who choose to engage in science and who do not have a close relative that works in science are not accounted for in the causal relationship described. The choices of these students are explored in this thesis.

Studies by other researchers have shown that various factors at school (see, for example, (Cheng, Payne and Witherspoon, 1995), factors in the affective

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\* Dearing reported on the National Committee of Enquiry into Higher Education



domain such as gender (Gallagher; McEwan and Knipe, 1997; Bell, 1997) and adolescent development (Jaffe, 1998) predispose some students to choose particular courses for post-compulsory education. The way in which a trend operates in a population sample lacks the power to explain the ways in which individual students arrive at decisions about post-statutory choices.

Chapter 3 deals with the nature of choice in adolescence as it is currently conceptualised. A review of current thinking about the way in which adolescents make choices will demonstrate that our ideas about choice have developed from a static to a dynamic model. Marcia's theory of career identity statuses based on Erikson's ideas about identity, was both influential in recognising variability in identity formation and acknowledged as limited by its linearity (Marcia, 1980; Erikson, 1968). The ideas of students, as they develop a career identity, go through temporal changes which will not be the same for all individuals. Current understandings about choice processes in adolescence are more dynamic, allowing that the routes to decisions may be non-linear, even circular, as young people match their self-image against their future potential selves. 16-year olds are commonly presented as approaching decisions about choices with certain attitudes, understandings and perceptions, and therefore research to date has centred on exploring these facets of teenagers' decision-making. The prevalent contributors to the field tend to discuss variations in the population in terms of whole group trends (see, for example, Malone and Cavanagh, 1997) and it was part of this research to find out more about what lies behind some of the trends that have been reported. Some approaches that have been used give a partial picture of students' thinking. On the one hand, attitudinal research can give a general picture of attitude at a particular moment, but it does not consider that attitudes may be volatile. On the other hand, cohort studies can demonstrate cross-sectional trends in the influences that may affect decisions, but not the patterning of individual pathways to choice. I had a more specific focus in my investigation of individual students' ideas about choice over several years. New insights were gained into how different factors operated in choice and into what students selected as they were forming their ideas.

The exploration of choice in the present work intends to assess the way that careers education and guidance provision over time influenced students' thinking about choice and to re-examine the assumptions in relation to occupational aspirations as a basis for careers guidance, which underpin current models. It will be argued that related research about the guidance of choice (presented in chapter 3) has mainly focused on provision, rather than the engagement of students with careers guidance.

By treating the student population as individuals rather than as a single entity, the detail of inter-individual differences may be illuminated. In order to further the field of understanding about students' choices in school, the thesis presented here was concerned with research into how individual students' ideas were formed and how the students themselves described the ways and means by which they arrived at decisions about the post-compulsory phase.

The research aimed to discover a way of talking about choice that was richer than descriptions of likes and dislikes of school subjects or favourable and unfavourable perceptions.

The aims of gaining deeper insights into choices, and particularly choices about science, are articulated in two questions:

- 1. How do secondary students' ideas about post-16 choice change as they go through the last three years of compulsory schooling?**
- 2. How does the pattern of change in students' ideas affect whether they make a choice for or against the further study of science?**

Chapter 4 starts out by considering methodological issues in relation to the research questions. I make a case for the chosen methodological approach of the study and I address pragmatic issues regarding the design and conduct of the research. The empirical work was designed as a qualitative enquiry that sought to go beyond perception, to delve deeper into choice and to explore the processes by which individual students make choices. The empirical work consisted of interviews with seventy-two students in six schools. The young people were a selected sample representative of the upper half of the attainment range, deemed by their teachers to be potentially capable of gaining above

average GCSE and double science award grades. The sample, therefore, allowed exploration of the ideas of people who were not obliged to reject science, at least at this stage of their education, on the basis of lack of prior achievement. To establish how young people's ideas changed, each student was interviewed four times between years 9 and 11 when they were between 13 and 16 years of age. Data were analysed inductively drawing upon ideas put forward by Gerwitz *et al.* (1995) that choice can be approached with different ends in mind and using different means to arrive at a decision.

Further, the methodological chapter explains how a theoretical contribution was made, based on the use of grounded theory and discourse analysis combined in a way that enabled a deep exploration of individual patterning of ideas connected with choice at 16. Statements that the students made were treated as primary data and qualitative analysis was used to support the development of theory from the data. An understanding of how the informants understood and experienced choice as they approached post-16 choices began to emerge and a theoretical explanation of choice was fashioned with concepts and patterns from the analysis (Glazer and Strauss, 1967). The processes involved in fragmenting the data into segments, coding the segments and clustering the coded segments into concepts is documented. The use of discourse analysis in a longitudinal study to interpret what people said about the way their ideas changed over time is discussed.

The following three chapters (5, 6 and 7) present the findings of the empirical work. The first of these chapters deals with the development of a way of looking at choice in mid-adolescence that takes account of the way in which individual students' ideas are formed. The finding that there are a number of ways in which students make their choices is modelled as a variety of *choice trajectories*. The course of the trajectories represents the variability of students' discourse over time as they describe their ideas about choice.

The second empirical chapter employs the emerging model to explain differences in terms of a typology of such trajectories that reveals diversity in the way that students draw upon human and material sources around them to construct their individual trajectory. In this way the basis of students' decisions about their future is explained.

The last of the empirical chapters focuses on the particular case of science in the light of the preponderance of studies which explore factors that deter students from further science studies rather than explaining young peoples' interest in science (for example Miller et al., 1999; Osborne and Collins, 2000; Rosser, 1995; Woolnough, 1997). In chapter 7 of this thesis a closer examination of the choices made in favour of science has informed our ideas about who chooses science and why. Four portrait sketches of students displaying different choice trajectories are presented to challenge the common image of the student who chooses science with one end in mind, namely to fulfil a long-held commitment to a career in science, and who therefore channels his or her energies and enthusiasms into science from an early age. The four portraits are used as the basis for a wider discussion about changes in students' ideas over the three years leading up to post-16 choices about science.

As a result of the insights in this thesis about the formation of choices, it is argued that the situation regarding choice generally and science choices specifically is dynamically more complex than has previously been drawn. The thesis supports related research about the role of attitudes to subjects (or the way in which they are taught) in the choices that some people make. However, the conceptual scope of explanations about choice is widened beyond attitudes. It will be argued that the improved understanding about the ways and means by which choices are made can lead to a change in the thinking which underlies the practices of choice guidance.

The variety that was found in the choice trajectories of secondary school students was not reflected in these students' descriptions of the way that choice was guided in schools. Theoretical developments in the thesis point to a need for differentiation in the approach to the guidance of post-16 choices, bearing in mind that students' trajectories were formed in different ways and therefore students may have different identifiable needs. I propose that teachers widen their interpretation of the scope of the National Curriculum so that students learn more about the applications of curriculum subjects to careers and everyday life. I suggest that careers education should similarly be widened to give all students access to information, not only about a range of careers, but also about the necessity to consider broad-based post-16 choices. In this way

hitherto unheard of careers predicted by commercial and industrial pundits will still be open to students. In the context of both science education and careers education and guidance there is evidence that there is room for improvement in helping students to develop their ideas about choice in a more thorough and informed manner.

Finally, several avenues for further research within the school context are outlined and applications of the typology of choice trajectories in other contexts are suggested.

## **Chapter 2. Sciences In Post-16 Education**

My central concern is to contribute to understandings about how subjects are chosen for post-compulsory education or training, with particular reference to the declining percentage of students opting for sciences and mathematics post-16 compared to other disciplines. Evidence of a downward trend of sciences uptake is presented in this chapter. Existing views are polarised about whether or not improved uptake of sciences at the post-16 stage (and therefore science viability) is connected to economic success in the UK. The necessity of improving the level of uptake of sciences in the post-compulsory phase of education has been vigorously debated against a background of a continuing downward trend. On the basis that there is an authoritative body of opinion in favour of arresting the decline in the uptake of sciences, I undertook research that aimed to explain more fully how the ideas behind students' decisions about post-16 choices were formed, and to see what bearing the formation of ideas had on decisions about science.

Researchers have looked extensively at attitudes to science in school and both positive and negative motivating factors have been linked to the uptake of post-16 sciences. Current understandings about how students arrive at decisions in relation to post-compulsory science were found to be quite narrow and incomplete and to indicate the need for research that would generate a more unified and explanatory picture of student decision-making. Some of the insights into what motivates students to choose science are discussed in relation to ways in which existing ideas can be extended.

Linked with the debates and expectations about post-16 sciences, a need has been identified in educational, economic and political contexts to go beyond statistics and perceptions in order to unearth the broader basis of choice for post-compulsory education (Driver, Leach, Scott and Wood-Robinson, 1994; Jenkins, 2000; Roberts, 2002; Woolnough, 1996). In order to explore choices about sciences more realistically I have conducted my research within the existing context of the full range of available options open to students at the end of secondary education.

## 2.1 The Uptake Of Sciences

During the late 1990s, in the commentary that usually accompanies the A-level results, journalists reported that the uptake of A-level sciences was problematic, (see, for example, O'Leary and Charter, 1996). The authors commented that teenagers continued to shun sciences in spite of the government's attempts to boost the subjects. It seemed as if one indicator of interest in science, namely examination passes at A-level, had gone down year after year.

The DfE consultation exercise in 1994 about the supply and demand of young people in science and mathematics, noted that the 1990s saw an increase in the proportion of the age group obtaining a pass at A-level, but it was subjects other than science that saw the largest increase (DfE, 1994). Sciences had benefited from the higher total numbers of students in post-16 education, but the increase in both biological and physical sciences was below the all-subject average. The report by NFER for SCAA confirmed that the combined percentage of science subject A-level and advanced GNVQ passes had gone down among students who took advanced examinations (Sharp et al., 1996). The extent of the downward trend was emphasised by comparison with the 1984 percentage of students specialising in mathematics and sciences (i.e. those taking only mathematics/science A-levels). The earlier figures showed that 30% of students took mathematics and sciences combinations. Twelve years later, in 1996, the figure had fallen to 17% of the total number of students taking A-level examinations.

The outcomes of A-level examinations have had repercussions for applications to science courses at university and therefore have given rise to concern among the scientific research community. The physical sciences are a particular problem. 'Nature', a science research journal, reported in 1999 that the numbers of students applying for entry in that year to British universities for science courses in physics, chemistry and engineering had continued to fall substantially. Using figures for university applicants, the most popular courses were business and management studies, followed by computer science, which had seen a 19.7% increase in its popularity in one year. In contrast, applicants

for physics dropped by 10% and chemistry by 9.3% compared to the previous year, indicating a continuing downward trend. A similar situation exists in America where a diminishing pool of students studying physical sciences has been reported and described as a 'looming crisis' (Bozac and Perez, 1994).

A decrease in uptake of particular subjects at A-level is likely to have a greater impact on university applications for science subjects than for other subjects perhaps with the notable exception of languages. A typical publication aimed at those involved in careers education for the year 9 subject options process at school contains strong advice about raising the awareness among students of the long list of options closed to those without a reasonable grade in GCSE science (Smith and Mathew, 1994). Coles pointed out that science courses in higher education are barred from those who do not have science A-levels (or their equivalent) and that a science degree is the main route into a science career (Coles, 1997). Those with post-16 qualifications in science, however, are eligible for non-science based courses in higher education, such as law, business studies and philosophy.

The extent of the apparent decline in interest in sciences has been ascertained by large-scale statistical approaches, which are informative with respect to trends, supporting the belief that there is less and less interest in continuing sciences beyond compulsory schooling. The figures have been used to point to a lack of interest in science, but more subtle aspects of the students' choices may have been masked in the statistics. Therefore, the reasons for the relative decline in the uptake of post-16 sciences have been sought within students' school and home environments.

### **2.1.1 School Factors**

Several reports have made claims that school factors were associated with different levels of science uptake. Sharp et al. (1996) using a large-scale statistical approach for a NFER report found differences in science and mathematics uptake in different types of school. Uptake was highest in independent and grammar schools and in those comprehensive schools with high academic attainment, as measured by the number of students attaining five or more grades A\*- C at GCSE. In an earlier study, in contradictory vein, an



analysis of the findings of the 1980-4 APU (Assessment of Performance Unit) survey provided evidence to refute selection for grammar school in Northern Ireland schools as a factor that could improve science performance and uptake (Bell, 1991). These studies point towards a complexity that cannot be revealed by a whole-population statistical approach.

Sharp *et al.* (1996) also found that single-sex schooling was a significant factor in science uptake. The highest uptake in mathematics, physics and chemistry was in boys' schools and the highest uptake of biology was in girls' schools. Uptake for sciences was higher among those students who had taken GCSE courses in three individual sciences (physics, chemistry and biology), rather than double certificate GCSE science; however, this was said to be possibly attributable to the type of school rather than the type of science and remained unresolved. Sharp *et al.* (1996), similarly to Milner, Ben Zvi and Hofstein (1987) earlier, found that teachers thought that a de-motivating factor for students, when considering post-16 choices, was the recognition that mathematics and science A-levels were more difficult than other subjects. They suggested that students themselves might be able to shed light on the factors that they considered to be influential in the take-up of advanced science courses. The report recommended that

issues raised would be illuminated by further in-depth research among students and their teachers in schools and colleges.

Sharp (1996), p.18

In the light of this recommendation, research that would empower students themselves to talk about their post-16 decisions was an important consideration when planning my study.

In a cohort study Cheng, Payne and Witherspoon (1995) found that schools made a difference in the uptake of sciences, but the research was unable to identify the factors that led to the variation. I will minimise the effect of overt differences in schools by selecting apparently similar schools in order to follow Sharp *et al.*'s (1996) suggestion that students' ideas should be a central feature of future research. Cheng (1995) found that the biggest determinants of choice were the subjects taken at GCSE and the grades predicted by teachers several months before the GCSE examination. Since high academic attainment is an

established factor in determining post-16 choice, data about GCSE grades achieved by students and the post-16 choices they make was taken into account in my research.

The quantitative connections between some school factors and science uptake have demonstrated the importance of some aspects of students' experience of choice. Previous research has represented choice as a dichotomy of influences that result in positive and negative attitudes that may or may not predispose a student to choose science. This does not explain *why* particular choices are made. The individual student voices are muted and as Fielding, Fuller and Loose, (1999) recommend in their study of school improvement, the student voice should be given credence so as to help to inform and illuminate those situations in which students find themselves.

### **2.1.2 Mixed A-levels**

Smithers and Robinson (1995) analysed trends in the popularity of A-level combinations. They reported a strong trend towards the growth of mathematics and/or sciences A-levels combined with non-science subjects and a corresponding trend towards broader university degrees. Improving the flexibility of organisational structures in schools has facilitated student mixed A-level choice. Advanced courses were previously chosen from among limited subject combinations, but since the mid 1980s more schools and sixth form colleges have allowed previously unavailable combinations like biology and French. In the 1980s mathematics, geography and economics were found to be important for the growth of mixed A-levels, but no figures are available beyond the early 1990s.

The upward trend in mixed A-levels continued into the 1990s when it was noted that less than half (41%) of those with science or mathematics passes at A-level had specialised in those subjects and the rest had taken mixed A-levels (DfE, 1994). Smithers (1994) used the steady increase in science/arts combinations over the years to support the idea of broader A-levels. Smithers and Robinson (1988) had found a groundswell of student opinion behind the growth of mixed A-levels. It was the students' opinion that choosing a mixture of post-16 subjects was the way to keep options open. Once again, the research

was unable to establish the way in which students had arrived at their decisions; it leaves us with a question as to whether a mixed A-level choice had been an active selection from a range of subjects or a passive choice by default.

## **2.2 Sciences and the UK Economy**

There has been interest in the supply of people with a science qualification for at least four decades. As long ago as 1968 the Dainton report suggested that there were grounds for anxiety about the swing away from the sciences (Dainton, 1968). More students seemed to prefer social sciences to sciences. The enquiry had been commissioned on the assumption that science viability was linked to the economic success of the UK. Whether the downward trend in the uptake of sciences at post-16 level reported above constitutes a problem for the future well-being of the economy has been long debated and continues to be the subject of ongoing discussion (Roberts, 2002; Skidmore and Evans, 2002; deHart, 2002).

### **2.2.1 The Debate**

The idea that the uptake of sciences was a problem prompted the Secretary of State for Education for England and Wales to set up a consultation exercise in 1993 which reported on the supply of science graduates. The downward trend was said to be of significance because the trend was

contrary to the needs of the economy and might warrant counter action.  
(DfE, 1994), page 3

Sutherland came to different conclusions about the extent of the 'problem' about the uptake of sciences (OFSTED, 1994). He initiated an inquiry into the apparent decline in the uptake of mathematics and sciences within the context of an overall increase in the number of students taking GCE A-levels. The final report concluded that, within the requirement of the education system to supply sufficient qualified graduates for employment in engineering or science related fields, no crisis existed. The report cautioned against drawing simplistic conclusions from complicated data. Straightforward comparisons could not be made between different years because the criteria for data inclusion have been

changed. Since 1994, reference has been made only to the age cohort but not to A-level modular results that have been delayed, because students who re-took modules after result publication could not be included in the statistics. Statistics may not have demonstrated a crisis, but general trends showed that the popularity of science was below that of most other subjects, whereas the popularity of English had doubled in the period 1980-1993 compared to other subjects.

Chapman (1994) reinforced Sutherland's view when he argued that the role of science education may have been grossly 'oversold'. He asserted that we would not need so many scientists in the post-industrial society of the twenty first century. Chapman advised that the important thing to do was to ensure that those science graduates that we do produce should be induced to stay within their field, and not be tempted into the business and financial sector. The supply of scientists would be sufficient. Chapman did not offer a strategy to assist the retention of scientists, but several possible factors may work against retention. As a result of policy consultation on the 2001 Research Assessment Exercise (RAE), The Biochemical Society cited the effects of student debt and poorer salary and career prospects on the retention of bio-scientists.

The Dearing report (Dearing, 1996) that reviewed qualifications for 16-19 year olds, expressed a strong concern about the declining proportion of students choosing to specialise in mathematics and the sciences. Dearing made suggestions to improve the uptake of sciences and recommended that

the regulatory bodies should develop a programme of further research into factors affecting the attitudes of parents, pupils and teachers to mathematics and science.

(Dearing, 1996), p.102

A national concern about science uptake was still prevalent.

When the National Committee of Inquiry into Higher Education published its findings (Dearing, 1997), there was no mention of a concern about the uptake of sciences and no specific proposals to promote their uptake in higher education (unlike the 1996 Dearing report). The key roles of higher education in delivering national policies and meeting the needs of industry for science, engineering and technology in research and postgraduate training were, however, recognized. Manpower planning was discussed as a way of meeting

industry's need and it was acknowledged that student numbers for some disciplines, teacher training for example, had always been subject to planning intervention where demand has had to be stimulated. However, manpower planning was not recommended for sciences on the basis that national manpower planning had a poor track record. The relevant phrase in the 1997 Dearing report in relation to my research concerns was that instead of manpower planning

the committee believe that the better option is to rely on informed student demand to shape the balance of subjects.

(Dearing, 1997), p.100

What exactly is involved in informing the student demand that we are to rely upon would need to be established by a method which unearthed the students' own understandings, a high-profile component of research in this thesis.

Economists at the Institute of Public Policy Research (1998) challenged the linkage between science viability and economic success on the basis that the impressive growth rates of Asian countries could not be attributed to past superior attainment in mathematics or science. The direct linkage is dubious and in any instance, other economic and political factors would be at work. Political commentators like Klein (2001) contend that the exploitation of the labour force as the basis of 'success' is a far more important factor than a strong science and technology base. The demise of the Asian 'Tiger' economies in 1987, in what became known as 'Black Monday', seemed to support the connection with exploited labour in the success of Asian economies.

Maintaining the uptake of A-level sciences, which are a strong enough platform to proceed to science-based careers, has implications for future generations beyond the provision of scientists and engineers for the immediate future. Educationalists need to maintain the supply of science teachers from teacher training colleges because science education is also important for scientific literacy. In 1983 science trainees were equally split between the three main sciences. In the academic year 1998/1999 277 physics graduates (12%), 392 chemistry graduates (17%) and 1,638 biology graduates (71%) were trainee science teachers. Smithers and Robinson (1995) reported that physicists were choosing to work in independent schools, making shortages more acute in the

state sector. The problem of teacher shortages for physical sciences was compounded by the withdrawal of student grants for higher education, as evidenced by the knock-on effect of increased numbers of unfilled masters and PhD studentships, physical sciences having been the most severely hit (Loder, 1999).

The comparatively shrinking pool of science graduates has generated fears of a spiral of decay in science teaching because companies and private schools may appoint the most qualified graduates or such graduates may be attracted into financial institutions. One consequence might be that the least qualified people will train as teachers and be less able to motivate the next generation (OFSTED, 1994). The cycle will be set to continue. Smithers and Robinson (1995) also pointed to the difficulties of attracting physics and mathematics graduates into teaching, but they found little solid evidence of a shortfall in recruitment to science-based courses in higher education. Since 1983 Smithers and Robinson acknowledged that the number of 18-year olds has fallen by one third, but

whether there is a real shortage of science graduates is uncertain  
(Smithers and Robinson, 1995), p8.

The DfEE's report on the projected labour market trends echoed Dainton's message of three decades earlier about the importance of science in the labour market (DfEE, 1996b). The report predicted a 15% growth in the demand for science and technological professions during the period up to 2006. The demand will not be met if the current downward trend in science and technology uptake continues and these figures support Dearing's 1996 recommendations that further research should be undertaken.

I concluded from the debate that the relative fall in post-16 sciences is a trend that touches important issues about the economic health and scientific research base of the United Kingdom, scientific literacy among the general population and the provision of highly qualified people to teach the next generation. Research which contributes to our knowledge of the causes of that fall is considered, in several accounts, to be worthy of investigation.

## **2.3 School Science**

In the late 1980s, the National Curriculum was established in England and Wales as a political initiative which designated science as a core subject throughout primary and secondary schools. The recommendations of the School Science Curriculum Review (SSCR) were adopted and the broad science education entitlement that this gave to all pupils was strongly supported by the Association of Science Education (ASE). From the late 1980s to the mid 1990s the National Curriculum in science went through a series of revisions as a result of criticisms and consultation exercises. The students who were the subjects of my research in the 1990s took science courses based on the statutory requirements of the National Curriculum.

Young people's experience of school science has long been held to be a highly influential motivator and de-motivator for students considering further study in the sciences. Students' attitudes have been examined to inform improvements in the experience of learning school science.

### **2.3.1. The National Curriculum**

The National Curriculum was introduced in England and Wales in 1988 and schools were required by law to devote at least 15% of total curriculum time to science in year 9 and at least 20% in years 10 and 11 (DES, 1988a). The establishment of science as a core subject was presented as an entitlement curriculum and assigned at least two aims by several commentators, namely to standardise the curriculum in all schools and to improve the scientific literacy of the nation.

Expectations from some quarters that the percentage of students studying post-16 sciences would increase with the introduction of a compulsory science National Curriculum in England and Wales have not been fulfilled (DfE, 1994). In the second SSCR lecture, following the publication of the government intention to establish science as a core subject for all pupils from the age of 5 to 16 (DES, 1985). Frazer (1987) explicitly stated the hopes for the future of science in post-compulsory education. He commented that there was wide agreement that the continuing wealth and prosperity of the UK depended on the

supply of well-qualified and imaginative scientists and engineers. To ensure this need was met was one of the justifications of the 'Science for All' policy. Frazer (1987) described the policy as one which would give the nation a pool of talent from which researchers, inventors, innovators, designers and managers could be drawn. However, the growth in the proportion of GCSE science passes has not been translated into a corresponding growth in A-level science. The relative decline in post-16 uptake seems to show that Frazer's optimism was not justified.

Teacher responses in protest against the complexity of the original proposals, in particular the number of attainment targets, led to a simplified version of the science National Curriculum in 1991, which was then criticised for the lack of progression in the attainment targets (DES, 1991a). The National Curriculum was reformulated in the same year for improved coherence and progression and the proposed five attainment targets reduced to four with modifications of the practical component. Jennings (1992) described the process of drafting and redrafting of the National Curriculum in science as a rapid sequence of proposals and consultation exercises. He noted an 8% minority of respondents who recommended waiting for the curriculum to be fully run before making changes. Jennings remarked that with the wisdom of hindsight this minority might have been a perceptive one. He also cited the emphasis on summative assessment as a source of tension with the original notion of reporting by profile component. He cautions that tests that focused on a limited kind of knowledge could have

a backwash effect on pupils and the curriculum that could be dire  
(Jennings, 1992), page 31

Managerial responses have ensured timetabling and pro-rata resources for the Science for All policy, but not for all the subsequent revisions. Sallis (1992) cautioned that efficiency does not guarantee effectiveness. Windale, Hudson and Smith (1995) found that, in response to the National Curriculum, teachers felt that they had to move towards more teacher-directed approaches as they struggled with what they saw as curriculum overload, shortage of time and pressure of assessment. The science working party on a National Curriculum for science had assumed that schools and teachers would interpret the programme



so as to provide learning experiences that would develop pupils' understanding, skills and attitudes and would stimulate interest so that pupils saw the relevance of science to their everyday lives (DES, 1987). Barnett (1993) argued for a reconceptualisation of the National Curriculum if cross-curricular themes such as science and technology were to have more than 'ornamental significance'.

Smithers (1994) judged that two of the objectives of compulsory double science, a double certificated subject at GCSE had been met. The first was an improvement in scientific literacy, indicated by an increase in numbers of students obtaining grades in GCSE science. The second was a correction of gender imbalance because more girls studied physical science and more boys studied biological science up to GCSE level than ever before. He concluded that a third objective of a greater uptake of sciences at A-level had not been met. The hope, that giving more girls the opportunity to study physics beyond the age of 14+ would stimulate girls' interest and would further contribute to higher uptake of sciences beyond the age of 16, was not fulfilled. Smithers (1994) reflected upon the fact that physics and chemistry GCSE uptake had improved as part of National Curriculum science, but that this had not been reflected in the uptake of A-levels. He recommended separating the three main components of the GCSE grade to identify a clear path to one or more A-level sciences.

Whether or not there is agreement about the relationship between wealth creation and a strong science base there is a policy in place, enshrined in law, that places science at the centre of the curriculum, one of the three 'core' subjects along with mathematics and English. Legislation accords an essential status to science within the curriculum, and the way that students view a subject, that is both a core subject and one which shows some evidence of decline in the post-compulsory phase of education, merits attention.

### **2.3.2 Learning School Science**

Head (1989) identified three phases in our thinking about learning school science over twenty-five years. In the first phase the learner was taken as being non-problematical and scientists in a given field identified the key concepts that they considered to be worthy of inclusion into the curriculum. In the second phase, throughout the 1970s and early 1980s, when 30% of students doing A-

levels were studying sciences or science and mathematics combinations, researchers focused on the learner in school. Research into science education and the cognitive development of children led to curriculum initiatives which matched the curriculum to the learner's ability to understand concepts. In the third phase the focus shifted to the affective aspects of learning with more attention being paid to students' perceptions of the learning experience.

Milner, Ben Zvi and Hofstein (1987) described the 1960s and 1970s as the golden age of the science curriculum when much energy was put into development and implementation of science curricula. The emphasis of the Nuffield Science Teaching Project, for example, was typically on teaching method and the project was a break with the past in two significant ways: more was demanded of students by way of understanding and there was a large increase in student practical work (Ingle and Jennings, 1981). Consequently, practical activity was brought to centre stage in all secondary school science teaching and schools were better provided with laboratories, apparatus and technicians.

The National Curriculum recognised the importance of practical activities in school science by designating the first attainment target as 'scientific investigation' (DES, 1988b). Woolnough (1985) addressed some concerns about the effectiveness of practical work in science. He found that much practical work appeared to have little to do with the activity of practising scientists, leaving little in the minds of students but memories of trivia; that it was expensive and narrow, divorced from strategies which address wider aims, and that it ultimately did not elucidate theory in the way intended. He suggested that

We need to rethink the purposes of practical work in science and then to consider the most appropriate kind of practical which will fulfil these aims.  
(Woolnough, 1985), page 2

Students came to science lessons with the expectation that they would normally be doing practical work, so that if the teacher produced other non-practical strategies, they could react negatively. Students who were more able were thought to be in danger of frustration with pre-programmed work, which

required them to deduce what may be blindingly obvious (Woolnough, 1985). Similarly, Piburn and Baker (1993) in the USA found that students saw practical activities as more and more convergent as they went through school. Science lost its appeal as getting the right answers increasingly became the key to good grades. What appealed to those students who did take science courses was the intellectual challenge of what they viewed as difficult subjects, particularly physics.

Achievement and liking for subjects are widely agreed to influence student subject and career choice (Keys, 1987; Stables, 1996). Improving children's learning was thought to boost understanding and achievement and, therefore, increase the possibility that students would choose science.

Two major curriculum projects aimed to improve students' understandings. Cognitive Acceleration in Science Education (CASE) was based upon the finding that the content offered in science courses was often mismatched with the students' capabilities (Shayer and Adey, 1978). CASE introduced curriculum materials to enrich students' experience and to influence the stage at which concepts were presented to students. The Children's Learning in Science Project (CLISP) also adopted a new approach. The ideas that the children brought to the classroom were not to be shelved or ignored, but were to be deconstructed so that the children themselves understood the status of their own ideas, which could be reconstructed in such a way that they logically fitted the evidence (Driver, Guesne and Tiberghien, 1985).

The constructivist approach to teaching science spread across the world. Ching-Chung (2000) for example, explored the relationships between student scientific epistemological beliefs and perceptions of constructivist learning environments in China. He recommended the constructivist approach to learning science for students who were appropriately epistemologically orientated.

Head (1989) recognised the value of curriculum initiatives within the framework of cognitive development, but, by the end of the 1980s, he came to the conclusion that the time had come to pay more attention to pupils' ideas about science.

It is their feelings, rather than their thoughts that we need to consider.

(Head, 1989), p.163.

Head suggested that research into the affective domain would be useful.

### **2.3.3 The Affective Domain**

Woolnough (1997) interpreted the affective dimension as the appreciation and enjoyment of science and concluded that the science teacher and quality of teaching are as important as the curriculum in inspiring students to study science. He recommended that teachers concentrate on giving students a sense of satisfaction and personal achievement in their science.

For, ultimately, it is not what science students know or can do that is important, but what they want to do.

(Woolnough, 1997), p70

He surveyed students in secondary schools using questionnaires, interviews and case studies and he demonstrated that some factors are identifiable as influencing students towards or away from science. Three out-of-school influences, namely job opportunities, attractiveness of science and home background and three in-school factors, i.e. science teachers, the science curriculum and extra-curricular science, were found to influence students towards or away from science.

In a previous study Watts and Ebbutt (1988) interviewed sixth-formers about their science lessons in years 10 and 11. Few of those interviewed could look back on their school science education with any clear sense of coherence and continuity. The Watts and Ebbutt interviews were about memories of science education and it would have been difficult for sixth-form students to remember the detail of what teachers seemed to be trying to convey about science and how their teachers participated in the careers education process. The authors described the nature of the data gathered as strongly anecdotal. This pointed to the need for non-retrospective data collection. Woolnough (1996) in the UK and similarly George (2000) in the USA found a general lowering of enthusiasm for science in and out of school and for a career in science as pupils matured between the ages of 11 and 16. Woolnough pointed the way to research about

individual attitudes to science in the comment that the most striking thing that came across in reading students' responses was

the individuality of the students and their reaction to science. Any description of such a sample tends to lose that individuality.

(Woolnough, 1996), p.306

Achievement in science was also correlated with some teaching approaches (Keys, 1987). The amount of science homework and the prevalence of learning that involves practical activity were both found to foster favourable attitudes towards science. Keys also found that girls were more likely than boys to perceive physical sciences, especially physics, as difficult. Jones, Howe and Rua (2000) attributed differences in attitudes to science to gender differences in extra-curricular experiences. Boys had more experience of tools, batteries and electronic toys and girls had more experience with bread-making, knitting, sewing and planting.

Girls into Science and Technology (GIST) was an intervention designed with the specific purpose of motivating girls. Kelly (1986) examined development of perceptions in individual students about science and science careers by surveying 1300 pupils at ten schools using an attitude-to-science test. The GIST initiative had only a marginal effect, mainly on the masculine image of science.

Doherty and Dawe (1985) undertook an exploratory study to find the relationship between students' developmental maturity and school science. Boys enjoyed school science more than girls and it was found that early-maturing girls tended to develop negative attitudes towards science at an earlier stage than boys. The authors commented that the longitudinal aspect of the study was an aspect of the design used by few investigations. Brickhouse, Lowery and Shultz (2000) found that girls' affinity with science at age 13 was related to their confidence in their ability to do science, their interest in the operation of mechanical things and/or their identification with the science teacher. Extending this study would benefit our understanding of whether girls with an affinity at age 13 continue to engage with science.

Young people are often concerned with the issues of the day. Driver *et al.* found that the majority of 16 year olds think that science knowledge emerges

from readily accessible facts (Driver et al., 1996). They commented that this would not help students to make sense of Creutzfeldt-Jakob disease and the connection with BSE (Bovine Spongiform Encephalopathy) cows.

A variety of factors involved in the learning of school science have been found to influence predisposition to science among cohorts of secondary students. Research has revealed trends in the factors that may be influential, such as practical work in class or out of class activities. What is not clear, however, is whether we may assume that a student who describes practical activity as trivial, or who has no time for extra-curricular science, will reject post-16 sciences. My research aimed for deeper insights by following, over time, the influences which helped to mould their individual dispositions and thinking.

### **2.3.4 Attitudes to Science**

Researchers have been trying to find out about secondary students' attitudes to science for decades, even before the recommendations of researchers in the 1980s.

A study in the early 1970s compared the attitudes and achievements of 15 year olds on Nuffield and non-Nuffield science courses. This research demonstrated that, for many students, school science was not connected with the everyday world of the student. Later in the decade a part of the SISCON study scrutinised the answers to a question set in a general studies paper about the attitudes of sixth formers to science and some ideas, which may be relevant today, emerged (Ashton and Meredith, 1976). Particularly notable were the responses of those who recorded that a high intelligence level (80%) and a conforming mind (70%) were needed to do science, along with the idea that the best scientists do not teach. An appropriate question about attitudes to science has not appeared in a recent General Studies paper, but these results could be compared with the views of children today.

Duckworth and Entwistle used a repertory grid technique to assess the attitudes to school subjects of 600 students (Duckworth and Entwistle, 1974). The grid had been developed to help pupils in grammar schools to make post-16 choices. They found that by the time choices were made towards the end of

compulsory schooling in year 11 pupils had a more clear cut idea than earlier in their schooling of the science/arts divide which would help them to make appropriate subject choices. The shortcomings of this sort of attitudinal research are that it lacks predictive ability in a way that is reminiscent of trait theory where traits (or in this case attitudes) are identified which bear little resemblance to what people actually do in different circumstances. Duckworth and Entwistle's (1974) conclusion that their data might imply that an identifiable group of female scientists exists, even at age 12, has yet to be tested. As early as the 1970s researchers like Glennerster and Hoyle (1973) proposed that more qualitative work should be undertaken so as to provide more explanation for students' attitudes.

Milner *et al.* (1987) in the USA explored the features that affect student enrolment in science at 12th grade and found that personal factors such as interest, future career and an inclination towards the subject were dominant. Tamir (1994) studied Israeli students' conceptions of science within the framework of the Second International Science Study and found that the importance of science to the individual had a strong association with the home background. Students who do not choose science may lack the knowledge to fully appreciate what they are rejecting. Tamir concluded that enhancement of positive attitudes towards science in the high school could improve students' disposition towards study at the tertiary level. Lightbody and Dundell (1996) investigated sixth form pupils' aspirations and schematic representations of career areas with either a technical or social orientation. They found that there was a difference between 'self' and 'other' identity and that females did not find science and technology off-putting per se, but their expectations of the work place deterred them. The longitudinal study that I undertook might help to answer questions about when the dichotomy between 'self' and 'other' arose.

Keys (1987) found that sciences were perceived as more difficult than other subjects, even among A-level science students, although no basis for this judgement was established. Sears (1992) noted that in some schools numbers of students taking sciences had increased, but the grades that they attained at A-level were on average lower than in previous years, reinforcing the idea that sciences were harder than other subjects. Fitz-Gibbon and Vincent (1994)

claimed to show statistically that it was more difficult to achieve high grades in science and mathematics than in other subjects and this factor may be a negative influence on those considering A-level subjects. Many other factors may have contributed to the statistical trends. Dearing (1996) addressed the disparity in difficulty of A-level subjects and recommended that standards in easier than average subjects should be re-examined so as to maintain a sufficiently high level in the sciences and mathematics for entry to university courses. The idea that sciences are seen as difficult has continued in the thinking of researchers such as Giachardi (2002) and Jones et al (2000) and the results of GCSE and A-level examinations seemingly support this perception.

Osborne and Collins (2000) obtained some deeper insights into students' attitudes to school science using focus groups to document the range of views that year 11 students (and their parents) held about the school science curriculum. They detected some discontent among students that accounted for perceptions about science. They found that students agreed with the legitimate place of science in the curriculum and had some insight, not usually gained in school, of the value of applications of school science in everyday life. The appeal and interest of science for secondary school students was enhanced among those who achieved more highly. Important outcomes of the work were recommendations that school science should be taught in a more contemporary way and that more choice should be available within GCSE science. I was interested in taking this work further by means of research that could establish which views are associated with changes in individual students' ideas about their choices.

## **2.4 Ways Forward**

The place of sciences in the choices that students make has been considered in two relevant contexts. In the economic context the statistical downward trend in the uptake of sciences in post-compulsory education has been seen to be a cause for concern. Politically, decisions about science education in the form of the National Curriculum that took effect throughout the 1990s gave all students (throughout compulsory education) access to the full range of sciences, as



discussed in section 2.3.1 above. Hopes that a universal science entitlement would stimulate interest in choosing post-16 sciences have not been realised.

Reports that point to a decrease in the uptake of sciences beyond secondary education regularly identify a need to find out why there is a downward trend and make recommendations which support my intention to undertake research into the way that students make choices, and specifically to go beyond raw statistics. In the 1996 NFER report about the take-up of advanced science courses Sharp made a strong recommendation for more in-depth research that would allow the students themselves to shed light on their choices about science. This was in tune with my decision (see section 2.1.1) to work with a sample of students approaching post-16 choices in such a way as to empower their voices. In noting the connection between higher academic attainment and the uptake of sciences in Sharp's work, I considered working with a selected sample of students with high academic potential. I was not able to address the issues that Sharp raised about single-sex schools since single-sex state schools would not be geographically accessible, but I was able to approach mixed, comprehensive schools situated in similar areas of socio-economic categorisation and considered to be higher-achieving according to their GCSE examination results.

Smithers and Robinson (1988) have demonstrated that the trend towards a choice of A-levels, which are a combination of science and non-science has become a significant issue in the choices that students make. However, the bases upon which mixed A-levels are chosen requires clarification. It was therefore important in my research to document the actual choices that students make and to pay particular attention to the way in which students' ideas change in relation to the A-level subject combinations or courses chosen.

Research about science choices has tended to concentrate on statistics relating to the popularity of subjects, the logistics of choice and attitudes to single, or to a few, factors known to operate in choice. There have been causal connections, strongly implied but infrequently justified, between attitudes and choices that students make. A direct relationship between perceptions and considerations about sciences as potential subjects for post-compulsory study has not been firmly substantiated. Therefore, there is currently an incomplete

picture of how perceptions among students about sciences and/or science careers lead to subject choices. The complexity of the field is evident from the research that I have discussed above, but my intention was to see how attitudes and factors that are known to influence students' decisions actually motivate them to make particular choices. As Woolnough (1997) pointed out it is what they want to do that counts.

The data collection period for my research began five years after the introduction of the 1991 version of the National Curriculum that was produced as a result of the several revisions discussed above. The impressions of the students about the classroom reality of the National Curriculum and the way in which their choices were affected by the implementation of statutory requirements in their schools, including the role of practical activities, were relevant to research about choices. The status accorded to practical activities by the students themselves is topical territory, particularly in the light of discussions that are taking place about the scope and usefulness of the practical component of science classes.

Whole population trends in students' ideas about science have been reported. Cohort studies tend to mask the detail of inter-individual differences and the way that a particular attitude leads to a particular choice. Woolnough (1997) noted in his research about school science (cited in section 2.3.2) that the most striking thing that came across was the individuality of the reactions of students to science. This gives impetus to my research which aims to explore inter-individual differences about students' recognition of the ideas that affect their arrival at post-16 choices. Little attention has been given to temporal aspects of student choice. I considered gathering data longitudinally so as to show which factors operate at which stages in the decision-making process and which factors are influential in decisions about the post-compulsory phase.

The idea of developing a more individual approach to finding out what exactly is involved in student choice was considered in this chapter in order to meet the identified need for a broader canvas for further research into the way that students think about sciences for post-16 study. In the light of the research needs identified in this chapter, my research explored the way in which students' ideas about their choices are informed. What students recognise to be

informing their ideas and how those influences are operating over time to assist them to arrive at decisions regarding post-compulsory education or training will contribute to a more holistic understanding of the way that choices are made at the end of secondary schooling. By formulating a longitudinal study I was able to follow the way that factors influence the formation of individual ideas as students approach post-16 choices

I have identified a need to research the changes in individual students' ideas over time and to follow the way in which they make choices about science. Taking into account the practicalities of choice wherein post-compulsory science is not chosen or rejected in isolation but from among a range of other possibilities, the research was broadened to include changes in students' ideas about choice generally in year 11. Therefore, in the next chapter choices about science were placed in the natural context of post-compulsory choices generally and the guidance of choice in secondary school for the next phase of education.

## **Chapter 3. Choices**

The need to make a more thorough examination into the ways in which different factors are involved in student post-16 choice has been established in the light of concerns about the relative drop in the uptake of post-16 sciences. Recommendations such as those contained in the 1996 NFER report call for more in-depth research. Previous researchers such as Sharp (1996) and Woolnough (1997) have made suggestions that an approach that focuses both on the individual student and the longitudinal dimension may be fruitful.

To facilitate the focus on individual choice processes I decided to place the ideas of the students centre stage and, therefore, to widen the scope of my research to take into account the developmental stage of the people making choices. The individuals involved were secondary school students between 13 and 16 years old and therefore considered to be adolescent. In this chapter I review prevalent thinking about the psychological and sociological underpinnings of choice in adolescence. In this way I was able to reach beyond perceptions of a designated subject area to explore how science was chosen from among the full range of options in the context of post-16 choices.

Further contextualisation of the research was achieved by recognising that when young people are forming ideas about their own future they are experiencing both the physical and psychological changes of adolescence. The way in which school support for the formation of young people's ideas is embodied in the work of school careers education and careers service guidance is considered and current thinking in the field is discussed.

The broad patterns of choice among adolescents have been explored in several research projects on a macro-scale and decision-making has been described in general terms. It is apparent that on the micro-scale of the individual there is scope to begin to capture the dynamics of the changes in ideas that occur between 13 and 16 years old.

## **3.1 Adolescence**

We have come to accept that a person of 16 years old is in the phase of her/his life called 'adolescence' as recognised by psychologists. For a study of people making choices at 16 I will consider adolescence as a period of life that involves changes that eventually lead to the establishment of a coherent identity (Coleman and Hendry, 1999). One difficulty of studying adolescence is the defining of adolescence itself. Coleman (1992) remarked that if termination of adolescence were to depend on the attainment of a certain psychological position, namely the formation of an identity, for some it would never end. Therefore, adolescence is more realistically viewed in a dynamic rather than in a static light.

The times at which young people make choices in secondary school for GCSE subjects and then for elective post-16 education is between the ages of 13 and 16 which is considered by psychologists to be the mid-adolescent period, a transitional period between childhood and adulthood. Typically, Hamburg (1997) describes adolescence as a time of upheaval, one of the greatest in the entire life span, when biological changes are pervasive, especially in terms of hormones, the brain and behaviour. Nurmi (2001) regards the adolescent as a young person who is navigating her or his way into adulthood by self-definition and increasingly more self-direction.

### **3.1.1 Choices in Adolescence**

Different approaches have dealt with complementary aspects of the decision-making processes that take place in adolescence with consequences for the future direction of a person's life.

Psychological studies tend to examine the way in which young people cope with the demands of decision-making. Nurmi (1997) for example, found that those people who constructed personal goals dealt with life-course transitions the most successfully. Kalakosi and Nurmi (1998) detected increased activity in young people's identity explorations and commitments to future education in response to the impending transition from junior to senior high school in the USA.

From the sociological tradition, the changes that occur in adolescence are approached in terms of socialisation and the way in which social contexts affect actions but avoid defining adolescence in terms of life stages. Hodkinson and Sparkes (1997) noted that in the transition from school to work, different perspectives place career decision-making in a pivotal, but paradoxical position. Sociological literature emphasises the dominance of socially constructed pathways, whilst policy-making operates on assumptions of individual freedom to choose. Therefore, Hodkinson and Sparkes (1997) developed a sociological theory of career decision-making that sensitises the researcher to the twin pitfalls of social determinism and seeing young people as having completely free will. Drawing on the work of Pierre Bourdieu (elucidated in Robbins, 1991) the theory presents a model of career decision-making which recognises the multi-dimensional nature of choice. Three interrelated strands are recognised. The first is the pragmatic rational decision-making located in the 'habitus' of the person. The second is the interactions with others in the youth training field related to unequal resources that different players possess. The third is the location of decisions within the partly unpredictable pattern of turning points and routines that makes up a life course. Nurmi (2001) in a similar vein presents a multi-dimensional idea of co-navigation through adolescence that is described as decision-making influenced by significant others, e.g. parents, peers and siblings. Hodkinson and Sparkes (1997) point to a lack of attention in research literature to the ways in which 'customers' of education actually make career decisions in the same way that I have identified a lack of evidence in relation to choices about science.

It is recognised in the present research that adolescents in the late 1990s operate in a social context that is very different from that of the mid-twentieth century. For post-16 choices in the second half of the twentieth century, the principle educational change has been that the age of compulsory education has been raised from 14 to 16. Secondly, more and more people go on to higher education following the large expansion, almost a doubling, of university places in the UK between the mid-1980s and the mid-1990s. There have also been huge technological changes and a marked change in working practices and, as Hamburg (1997) points out, one of the factors that has drastically changed the

experience of adolescence is the difficulty in foreseeing the years ahead. In adolescence now there is probably more ambiguity and complexity about what constitutes preparation for effective adulthood than ever was the case before and my research centres on the students' views of how they have been prepared for post-16 choices. Moreover, Hamburg considers that the version of life seen on television creates only a shadowy image of adult experience, a mix of reality and fantasy. A projected consequence of the many changes that have occurred would be the way in which the role of the school might change ways of providing support for decision-making about the post-compulsory phase.

The fusion of the psychological and sociological is useful because it recognises that the context in which adolescents develop has important implications for psychological functioning. Adams, Montemayor and Gullota (1996) described Hill's influence in the 1970s as a leading advocate for a developmental contextualist view of adolescence. From this perspective, identity and its achievement were considered as psycho-sociological functioning and studies of adolescence depicted a particularly active time for choosing between a number of alternative routes with respect to future education, career and interpersonal commitments. One particularly influential theory, Marcia's theory of identity statuses will receive some attention in the next section.

### **3.1.2. Adolescence and Identity**

Increasing self-determination and decision-making are considered to be essential components of identity formation in relation to the changing experiences of people at school in their mid-teens. Erikson (1968) particularly through his coining of the term 'identity crisis', has influenced all contemporary formulations of identity. Erikson considered adolescence to be a time of establishment of self-identity through a series of crises and decisions.

Marcia's (1980) identity status paradigm extracted two dimensions from Erikson's work. Firstly, he identified a phase of exploration which signifies the search for a more complete sense of self and, secondly, commitment which is the act of deciding upon a goal. Marcia's resultant four identity statuses depicted below were heavily flavoured with Erikson's perspective of crisis and

resolution. The descriptors have been useful in adolescence research because they include a longitudinal formative element that embraces Nurmi's (2001) idea that adolescence has to be navigated. Marcia (198) referred to identity as an existential position, to an inner organisation of needs, abilities and self-perceptions and warned that identity is a difficult term to delimit.

1. The achievement status is where there are high levels of both exploration and commitment. Marcia describes the people in this group as balanced thinkers.
2. The moratorium status is where there is active exploration without much commitment. People with this status tend to be more anxious and depressed and display more creative thought.
3. Foreclosure is characterised by commitment without adequate prior exploration. This status often stems from expectations of parents or other significant figures.
4. The diffusion status is distinguished by a relative absence of exploration and commitment. People with this status are more likely to be apathetic and disinterested and may be especially prone to academic difficulties.

Marcia's ideas about identity formation have clearly been highly influential. By 1993 more than 300 studies based on his identity statuses had been carried out. Muuss (1996) commented that the statuses have proved to be particularly useful in psychological studies in which different identity statuses were associated with psychometric parameters. Erikson (1968) himself was careful not to make his concept of identity a static one, for example, he cautioned that a young person might be in a mild state of identity diffusion without being thoroughly confused. In the 1990s, the developmental tasks of identity formation have continued to be recognised as evaluation, self-organisation, decision-making and commitment in adolescence, but the linear paradigm proposed by Marcia (1968) has been criticised as limited. Swanson, Spencer and Peterson (1998) pointed out that linearity in a theory of identity formation takes insufficient account of the complexity of the experiences of adolescents, which affect the way that developmental tasks are achieved. Circularity, amplification and unpredictability therefore, contribute to identity formation and identity processes are affected by a variety of school and home



environmental contexts. Swanson *et al.* (1998) used a model of multiple influences to explore the relation between possible selves, academic performance, motivation, self-esteem and persistence in performing tasks with grades achieved in school. It was found that 14 -15 year olds who endorsed elaborated and positive selves outperformed the other groups in academic achievement, although a longitudinal approach would have been useful in order to establish the relative temporal aspects of this relationship.

Research about choice in adolescence is still often tied to Marcia's (1980) original conception of the formation of four types of identity statuses and the idea of variations in exploration and commitment phases leading to multiple identities has been a useful starting point in exploring the formation of ideas for post-16 educational choices. However, researchers continue to link separate factors in whole populations to the development of aspects of adolescent identity. Brown's (1990) work for example suggested that peer groups were the major influence in the establishment of social identity, but the conclusions raise questions about how, when and on whom the influence operates.

The choices that are made by 16 year olds in relation to career, education and interpersonal commitments are supported by personal, social and health education (PSHE) programmes and careers education and guidance programmes in all secondary schools. The next section deals with the guidance of choice with respect to post-16 educational choices.

## **3.2 The Guidance Of Choice**

Careers education and guidance is officially a part of the National Curriculum and aims to guide young people's learning in relation to the first steps towards working life. An understanding of the basis and operation of this role is therefore informative in relation to an exploration of student choice.

### **3.2.1 The Basis of Careers Education and Guidance**

Between 1970 and the end of the twentieth century, documentation about careers education and guidance showed a change from a basically vocational model, in which student vocational projection was central, to a model which

emphasised student self-evaluation in relation to post-16 choices. The aims of the 1970s model of careers guidance were couched in terms of matching clients' attributes, abilities and vocational interests to suitable careers or jobs (Watts, Super and Kidd, 1981). The guidance model, based on assumptions of occupational aspirations, started with ideas presented by the client and worked outwards from there. In the 1980s careers guidance developed to encompass Gottfredson's finding that career aspirations were compatible with individual self-concept, particularly personal academic potential (Gottfredson, 1979). Careers guidance programmes in schools used both student self-evaluation strategies and subject teacher predictions about achievements in public examinations to help to inform post-16 decisions.

In 1991 the UK National Curriculum Council adopted the later, broader notions for the foundation of the updated 1990s model of careers guidance. Recommendations were made that secondary schools should offer students access to individual guidance, systematic careers programmes, direct experience of the world of work, access to up-to-date information about educational, vocational, training and careers opportunities and, finally, the opportunity to compile and review a record of personal achievement. The emphasis was on the educational role of guidance and the promotion of effective choice, realistic choices and career decisions, whilst taking into account opportunities and opportunity structures available locally and nationally.

In the mid-1990s calls to advise students about career opportunities continued. The 1995 report about the careers service stressed that in the light of the trend for more and more 16 year olds to stay on in education there was:

...an increased importance on young people receiving independent, realistic and up to date advice about the opportunities open to them and how they can be assessed.

(Morris, 1995), p.1

Shepherd, the then Education Secretary, in the foreword to a consultative document about employability, commented that equipping young people for working life was an important aspect of children's learning (DfEE, 1996a). She considered this to be particularly critical between the ages of 14 and 16 when young people are faced with choices which can affect the rest of their lives. The

1996 consultative document asserted that a broad and balanced education was a central aim of the 14-19 educational reforms (DfEE, 1996a). Careers education, based on prevalent assumptions was an intrinsic part of the reforms.

Present models of career choice are based on the belief that people make discreet, rational choices about stable and clearly understood options.  
(DfEE, 1996a), p.1

In the proposal that part one GNVQs should become available for year 10 pupils there was said to be plenty of scope in subject teaching to raise pupils' awareness of the world of work as well as developing key skills. The paucity of evidence about the way in which (or even whether) subject teaching raises awareness of the world of work and the way that individual students experience choice presented a challenge for my study.

### **3.2.2 The Operation of Choice Guidance**

In this section, I will discuss the ways in which research about the operation of careers education and guidance in secondary schools led to the identification of areas that might benefit from further research.

The NFER team found that careers education and guidance provision in schools was variable across 66 schools in 11 areas across the country (Morris, 1995). Young people in 11-16 schools were more likely to have had a wide range of careers-related experiences and have a higher degree of opportunity awareness than those with sixth forms. Provision was better in those minority of schools where there was good school-careers service interaction and where careers officers were involved in curriculum planning and review. For most of the schools, career's officers and school staff had not been able to work together in such a structured way. Further, the NFER report indicated that students had made progress between year 10 and year 11 in terms of transition skills such as personal awareness and opportunity awareness in connection with post-16 choices. Most said that they had received some help from careers officers. To further this research I examined students' changing ideas about post-16 education in connection with careers-related experiences.

A feature of careers guidance programmes in schools is the careers guidance interview, perceptions of which Millar and Brotherton gauged with a sample of

students selected from the lower achieving classes in year 11 (Millar and Brotherton, 2001). These students, who all hoped to leave school to get a job or were uncertain about their next step, found the initial careers guidance interviews to be helpful, although there were inter-pupil differences. A consultation paper which was concerned with the supply of newly qualified young people, examined the assumptions of careers guidance and cast doubt about whether higher achieving young people chose A-level subjects on the basis of career factors (DfE, 1994). What evidence students used to assess the patterns of labour market demands was particularly unclear. Morris (1995), in a discussion of a DfEE report about careers guidance, noted that the delaying of the career interview for those who were certain that they were going on to A-levels was designed to give priority to those who had little clue about post-compulsory destinations. This practice may leave potential A-level students with insufficient advice about potential careers and particularly careers with a requirement for science. My research included strategies designed to discover how young people thought that choice guidance, including the careers interview, operated in assisting the formation of post-16 choices.

The model of careers guidance based on occupational aspirations gained some support from a study that assessed the relative stability of these aspirations which were found to be stable among 13-16 year old boys and girls (Furlong and Biggart, 1999). The study design used questionnaires that were administered to classes in school with a 100% return rate. The relative stability of career aspirations was assessed by asking which jobs students had thought of doing and about their own suitability for named occupations. Furlong and Biggart (1999) found that students were differentiating in terms of a potential socio-economic image for their likely selves. They concluded that secondary education is not associated with a radical re-think of occupational futures, but the results cannot show how individual students' ideas changed or how ideas were constructed. The research made the assumption that there were occupational aspirations in the minds of all young people. Therefore, in Furlong and Biggart's assessment of 'career aspirations' it was not possible to distinguish between a fleeting idea and a thoughtfully considered option, a distinction that I was able to address in this study.

There is no evidence to suggest that there has been much change since the 1960s when the vast majority of pupils and their parents thought that one of the most important purposes of school was to help the student get as good a job or career as possible (Morton-Williams and Finch, 1968). Careers education and guidance is one of the five cross-curricular themes of the National Curriculum and the NFER report envisaged that added attention would be given to careers education in schools (Morris, 1995). Of the four learning outcomes in the section on careers education and guidance 'opportunity awareness' is one that will significantly alert students to the importance of science for many occupations. The report expressed a concern to relate careers education to careers guidance, particularly as the research for the report found that subject teachers featured quite strongly in giving help to young people about their choices. In the eyes of students schools appeared to be relatively ineffective in helping young people to learn about working life. Whether the students in the NFER study considered that it was the teachers' role to educate them about working life was unclear. The way in which teachers contribute and the value of their contributions to the choices that students make was an important matter that concerned me in my research.

Choice guidance seems to be managed on the basis of a set of factors that operate in one way for all students over the three year period before choices are made. I have indicated that the students may experience choice guidance in a more complicated way than has been implied, particularly when both the impact of careers guidance on individuals and longitudinal variations in students' ideas are taken into account.

### **3.3 Choice Studies**

A number of studies about choice in different contexts are discussed to bring out the common factors that have been discovered in a variety of situations and to point to areas that need further examination.

In her study about the part that television plays in career choices Hawthorn (1996) worked on the basis that beliefs about our own preferences and capabilities in relation to the world of work are formed over a long period of

time. Hawthorn developed the hypothesis that a conceptual envelope formed over time and was shaped by people with whom we identify and also by the people whom we imagine to be farther afield. When we consider Hawthorn's theoretical conceptual envelope we are cautioned, as we have been in the literature about adolescent choice, against static and oversimplified models of choice.

Stables (1996) examined the processes by which people made choices between subjects and between courses in schools and colleges. The research focused on the processes of choice and contributed to the debate about whether choices at 14+ were genuine choices for students of all abilities and home backgrounds. Trends related to the unequal resources possessed by different students were demonstrated to point in much the same direction as anticipated by the Hodgkinson and Sparkes (1997) model of career decision-making outlined in 3.1.1 above. Stables' (1996) study was unable to reveal how the differences worked for individual students because student cohorts from different school years were used, adding more weight to the decision to design a longitudinal study for my research. Ball, Bowe and Gewirtz's (1995) study about choice reinforced the sociological view that choice is not value neutral and therefore may be experienced in different ways. Ball *et al.* found that parents approach choices about their child's secondary school in different ways depending on how they are oriented culturally and materially towards the education market. The ends for which choices were made were found to be crucial to decisions and to vary with the social class of the participant.

Moving from 14+ to 16+ choices, Stables (1996) asked a sample of students who were all qualified to do A-level about the way that they had chosen A-levels. Interest and enjoyment were found to be the most important influences in subject choice, followed closely by career prospects. The same factors were uppermost in the minds of those people who advised the students. Stables sought to ask participants about their own perceptions of the processes at work. The influences on choice were pre-determined and presented in questionnaires and therefore respondents may have felt forced to identify a dominant influence from the range offered. Further Stables discovered an unstable trend with respect to liking for subjects in students between the ages of 14 and 16, which

indicated that students' ideas were in flux, although this instability was not reflected in the conclusions about the way that choices were made. The temporal dimension in my exploration of choice offered the opportunity to follow trends in students' ideas more closely.

Wikeley and Stables (1999) compared students' reasons for choosing particular subjects in year 9 with reasons given in a study that had been carried out 12 years before. Gender differences were found to have reduced, but were still present and schools seemed to be ineffective in giving clear and influential advice on a par with that from home. Wikeley and Stables expressed concern about a conflict between the ways that schools still talk to students about specific career aspirations and the realities of the needs of the labour market for transferable skills. They noted that students in the study were aware that there are wider needs than those related to a specific career, although the question of how this awareness affected their decisions remains to be answered.

In the choice of a post-16 institution Foskett and Hesketh (1996) found that the parental influence on choice was strong at a general but not at a specific level. Therefore, by the time young people were 16 they dominated the decision-making process, but they made choices within boundaries set implicitly or explicitly by parents. Foskett and Hemsley-Brown (2001) explored the reasons behind selection of post-16 institutions by studying the market dynamics in action when the choices year 11 pupils made (demand) interacted with the information provided by further education institutions (supply) in the FE market place. They introduced a longitudinal dimension by administering questionnaires at three stages. The variations that they found in the way that people experienced choice according to the time at which choices were first considered and the nature of the 'catalysts' that initiated the process were pertinent to my research interests.

In summary I have discussed how choice studies strongly suggest that considerations that influence choice can vary within a population (Ball *et al.*, 1995; Hawthorn, 1996). With respect to students in secondary school, uncertainty exists about the stability of their ideas, their needs beyond conceiving and responding to a career idea and the timing of considerations about choice. Bredo, Foersmon and Laursen (1993) in examining choice for

higher institutions in Denmark acknowledged that a useful theory of educational choice must be multi-causal. Nurmi (2001) predicted that new analytic tools would lead to new conceptual tools that would assist the exploration of adolescent development. We are assisted in our thinking by Kelly's (1955) theory of personal constructs in which each person constructs their individual reality. This theory has been found to be useful whenever a person puts a meaning on an event.

The world is open to an infinite number of constructions and many of the best ones have yet to be devised.

Kelly (1955), p.12

The intention of my study to examine the complexity, variety of time scales and ways that students' ideas are formed has been signalled in the research about choice discussed in this section.

### **3.4 The Personal Roots Of Choosing**

I return to the recommendation in the Dearing report (1997) discussed in chapter 2, namely that the balance of subjects in higher education should rely on informed student demand. The present research will attempt to illuminate the way in which student demand is informed and how influences such as parents or careers education and guidance are involved in shaping students' ideas as they approach post-16 choices.

The way that students view the working of careers education and guidance with respect to their own choices and whether they themselves felt that a full range of options had been laid before them, has yet to be explored and was therefore a component of my research. Career aspirations, which seem to form the rationale for the provisions of careers education and guidance, were found to be relatively stable among adolescent populations. Researchers used approaches that made the assumption that students already have career aspirations, whereas some students may have felt obliged to respond and therefore to cite high visibility occupations. Wikeley and Stables (1999) have expressed disquiet about this intrinsic assumption in the literature that self-definition with respect to careers will take the form of a career idea or a career direction. A focus on the individual student in my investigations into choice made it easier to identify



ideas of self-definition that students had conceptualised, and to ascertain the stability of personal career aspirations that students themselves have considered, rather than those suggested by a researcher.

The influence of subject teachers in careers education and guidance, which has been cited as relevant in improving student awareness of the world of work, was examined in my work. The development of students' ideas was also tracked in relation to other pertinent factors, which the students themselves identified during the course of my study. My research sought to recognise the circularity, amplification and unpredictability in the formation of ideas and in relation to career identity processes and to post-16 choice and commitment, as discussed in this chapter. In particular, the research methods that I used in the exploration of post-16 choice encompassed the concept that each person constructs their personal understanding of the activities in which they are engaged.

Support for a longitudinal study came particularly from Hawthorn's (1996) work, which theorised a conceptual envelope that developed over time. I wanted to discover more about the conceptual envelope nearer to the time of its early formation in order to obtain more immediate evidence than that used by Hawthorn and, therefore, to sharpen up the picture of the influences on people's ideas. It has been established that most of the advice comes to secondary school students from parents or the school. A longitudinal study was able to follow the influences that caused changes in the students' ideas, which led eventually to post-16 educational choices

Studies about the processes involved in post-16 choices have produced some helpful insights, which were taken into consideration when designing my study about choice. Several researchers isolated key factors in subject and course choice using quantitative techniques. Stables (1996) identified the prevailing factors that influence choice. Foskett and Hesketh (1996) concentrated on the choice of post-16 institution and the timing of active thinking about choices and Wikeley and Stables (1999) identified a continuing trend to advise students on the basis of career ideas.

Attitudinal surveys have dominated the field and quantitative analysis has given an overall picture about the way in which attitudes can change with a

specific intervention. Solomon (1997) writing in the specific area of gender and science comments that the GIST (Girls into Science and Technology) research:

'made no effort to explore the personal roots of choosing'.

Solomon (1997), p. 412

Indeed she feels that numerical data can neither describe nor analyse the act of choosing and she recommended that research should be more concerned with the structure of personal choosing.

Therefore, I have arrived at two research questions that address general issues about choices in adolescence raised in this chapter and specific issues raised about science choices in the previous chapter. The research will address the following questions:

- 1. How do secondary students' ideas about post-16 choice change as they go through the last three years of compulsory schooling?**
- 2. How does the pattern of change in students' ideas affect whether they make a choice for or against the further study of science?**

My research questions point to a study that attempts to concern itself with the personal basis of choice that 16 year olds make and therefore will be a qualitative study. To explore the personal roots of choosing I will aim to track individual students' ideas for some time during the period before post-16 choices are made. The advantage of following the same students is that individual as well as inter-individual differences can be picked up whereas cross-sectional studies, as Schneider (1993) explains, identify typical changes and the data can only be applied to universal development. To capture the individual choices that students make I will have to examine the history of what Nurmi (2001) described as personal action constructs in the years prior to that in which decisions were made.

Different frameworks about choice operate for the sociologist and the policy-maker. Sociologically the dominance of socially constructed pathways means that not all students are equally empowered when they make choices. This has been discussed in relation to the work of Ball *et al.* (1995). Current education

and training policy discourses such as that in the 1997 Dearing report on higher education in Britain often focus uncritically upon notions of free choices in a free market (see chapter 2). Career decisions made by the young people who are the 'customers' have become central to the operation of those policies.

Hodkinson and Sparkes (1997) point to a lack of attention, in either policy or research literature, to the ways in which 'customers' of education actually make the career decisions upon which policy is so dependent. Post-16 decisions are important for demand in higher education and, therefore, the focus on the formation of these decisions in the research for this thesis addressed these concerns.

To go deeper into individual choice there is a need for an exploration of which type of patterning of ideas leads to which sort of choices. Thus, based on recommendations that we need to look deeper than attitudes so as to unearth what lies behind student choice or, as Solomon (1997) puts it 'to explore the personal roots of choosing', I considered methodological options and embarked upon a three-year longitudinal study, which is documented in the following chapter. The structure of the study is justified in terms of exploring the shaping of an individual students' choice over time in the way that is demanded by my research questions and by areas for further research that are suggested by appraisal of current research in the field.

## **Chapter 4. Methods**

It has been established in the preceding chapter that my research aims to examine the formation of underlying ideas about post-compulsory education as secondary school students between the ages of 13 and 16 approach post-16 choices and to examine how students' ideas change over time. The development of a way of looking at choice that established individual students' subjective interpretations of who and what had influenced ideas about choices was a central objective of the method, as was the longitudinal dimension.

This chapter addresses methodological issues, describes the design of the study and documents ethical and pragmatic issues with regard to the collection of data. Existing conceptual development in the field was too limited to address the research questions and analysis therefore could not be driven by well developed theory. Analysis using grounded theory procedures enabled the development of theoretical concepts, through the analysis of student discourse.

### **4.1 Methodology**

Current thinking sets choice in the secondary age group in the context of the psychological and sociological changes that take place in adolescence and that lead to the construction of a young person's self-identity as discussed in chapter 3. The assumption in previous studies that students are influenced by a variety of factors, both in and out of school, to arrive at their choices is adopted in the present study.

In attempting to identify a cause and effect for the actual choices that students make, the majority of other studies discussed in chapters 2 and 3 assumed what could be seen as a broadly positivist approach. As put forward by several researchers, (for example Hage and Meeker, 1993; Hughes and Sharrock, 1997; Usher, 1995) the positivist tradition seeks to describe relationships between variables and hence to establish universal laws. I

examined the problem of student choice within an interpretive paradigm as an alternative to this approach, because the interpretive alternative seeks to uncover knowledge that cannot be encompassed by laws, and was, therefore, more suited to the research questions posed. My interest was in the way that students' individual ideas were formed and voiced. Therefore, an investigative stance was required which encompassed interpretative understanding or 'verstehen' as encapsulated by Weber (1949) and explained by Hughes and Sharrock (1997).

We are not interested in the unique and specific attributes of ordinary natural phenomena such as blades of grass or clouds in the sky... we are however, very much interested in the unique and specific attribute of other human beings, in knowing all kinds of things about particular persons.

Hughes and Sharrock (1997), p.99

When previous studies (see chapter 2) have reported on the attitudes of students to science (its importance, its relationship to industry, the economy and the image of the scientist in the workplace), they have not been able to demonstrate the ways in which students arrived at those attitudes. It has been established, and it is widely recognised, that decision-making in adolescence is a complex process. It has never been established that post-16 choices are made, in every case, as a direct consequence of attitudes. From a Vygotskian\* perspective, my research explores the formation of an aspect of consciousness in which socially meaningful activity (Tätigkeit) will play the role of an explanatory principle and serve as a generator of consciousness (Vygotsky, 1986). In the context of secondary schooling, socially meaningful activity may include interaction with friends, family, teachers and officers from outside agencies such as the careers service. Consciousness will encompass the ideas that students synthesise to arrive at their own opinions. The way in which socially meaningful activities operate in the sample can be revealed from the psycho-sociological perspective to uncover the way in which a student's self-identity was constructed over time.

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\* Vygotsky took the philosophical position that culture and consciousness constitute the actual subject of an enquiry and psychology was regarded as a conceptual tool. Vygotsky sought to avoid the situation where states of consciousness are 'explained' by the concept of consciousness.

The methodological approach taken in a study of teacher experiences in their first year of teaching was influential in my research (Nias, 1989). Nias allowed the teachers their own agenda in talking about their concerns. She used a very loosely-structured interview technique, in contrast to the tightly-structured repertory grid technique used in much of the research discussed in chapter 2. Nias talked to primary teachers and modified questions as she went along to take account of the interests of the interviewees. Interviews gave teachers the opportunity to express themselves in their own words, so that the theoretical concepts developed by Nias (such as 'isolation') were grounded in concerns that teachers expressed and not those of the interviewer.

Discourse analysis provided a perspective from which I could begin to make sense of the data from the interviews. The form of discourse analysis used makes several assumptions; firstly, that each student constructed their own version of the way in which they made choices; secondly, that they used linguistic resources that went beyond description and finally, that their talk was context dependent (Potter and Wetherell, 1987).

The design of my study about post-16 choices followed grounded theory procedures. Grounded theory, as described in section 4.5.1, is an approach in which there is a meshing of theorising and data collection. Therefore, the design evolved along with data collection and I developed frameworks for analysis by engagement with the data itself. A search for relevant concepts in the data began with the earliest data collected, in this case pilot interviews (see section 4.4.1 below), and any concepts found in the data informed the direction of the first round of interviews when students were in year 9. The aim of the grounded theory approach as described by Corbin and Strauss (1990)

is to develop a well-integrated set of concepts that provide a thorough theoretical explanation of social phenomenon under study.

Corbin and Strauss (1990), p.5

As discussed in section 4.5.2, discourse analysis is concerned with the detail of interpretation and grounded theory works broadly at the level of analysis. Data analysis, guided by the techniques of grounded theory and inspired by Potter and Wetherell's (1987) mode of discourse analysis, led to conceptual

developments and the emergence of theory. By the use of grounded theory an evolving theory was 'discovered' in the data, so that by analysis of each successive round of interview transcripts over three years, potentially relevant issues could be identified, followed up in the next interviews and so on (Glazer and Strauss, 1967). Each concept that could be grounded in the data earned its place in the strands of an evolving theory.

## 4.2 Design

A qualitative approach was adopted in the present work because the research questions sought to grasp each individual student's interpretations of their experience of choice.

What qualitative researchers attempt to do is to objectively study the subjective states of their subjects.

(Bogdan and Biklen, 1992)

Bogdan and Biklen (1992) put the emphasis on the subject who, in the present research, is the individual student. Cohen and Manion (2000) consider that quantitative approaches lack explanatory power and fine detail, both of which were required for my research. These features are

lost to the broad-brush generalisations which are free of the temporal, special or local contexts.

Cohen and Manion (2000), p. 172

Data collection methods were considered in the context of the need to arrive at a workable understanding of individual human experience and to provide longitudinal data to capture the temporal aspects of choice.

The decision to interview, as opposed to using questionnaires, was made in the interests of using a research tool that was sufficiently sensitive to obtain the depth of data required to be able to compare both qualitative differences in the formation of students' ideas at different times of secondary schooling and differences between individuals. Related research in the areas of student choice and the uptake of sciences post-16 has relied heavily on questionnaires, as discussed in chapters 2 and 3. Some of the limitations of the questionnaires as a research tool in relation to the present research are discussed in chapter 3. When using questionnaires, the same questions have to be answered by all

respondents, whereas the semi-structured interview has the flexibility to build upon an individual student's previous responses and, therefore, the potential to reach beyond whole population trends. Elliot (1991) recommends the interview as the best way of discovering what a situation looks like from an individual's point of view, and it was insight into the individual formation of choices that I sought. Interviews have been promoted for their ability to provide greater scope than questionnaires for clarification and further exploration of responses (Biggs, 1986); therefore, I considered a face-to-face encounter to be the most useful research tool for this particular study.

The interview was also favoured because teenagers are at an age when ideas are in flux and they are constantly reorganising and developing their perspectives (Coleman, 1992). Therefore, ideas that students held in previous interviews were explored with the student at a later date to assist an understanding of how ideas had changed. Young people of 13-16 years old, the target ages in the study, are at a volatile time in their lives and the pressures of school, along with a preoccupation with their physical and social development, could result in the questionnaire being answered superficially, resentfully or with caution. I took into consideration preliminary work in the form of a small-scale consultation exercise in which a small group of teenagers expressed a strong preference for conversation over filling in questionnaires.

#### **4.2.1 Interviewing**

The research aimed to get underneath teenagers' answers to questions so that the young people were not controlled completely by the researcher's agenda and they felt encouraged to air their concerns. When I first introduced myself to the 72 participants who were to be interviewed, I explained that the study was about what they thought of school subjects, emphasising that it was their ideas that were sought.

Cohen and Manion (1995) are of the opinion that it is easier to access respondents' meaning in an open and respectful dialogue. In the interests of such a productive dialogue, students were given opportunities to ask questions of the interviewer and the interviewer made it clear that it was student opinion



not parents' or teachers' opinions or the official view of the school that was sought.

Several writers: see for example Fontana and Frey (1998) have cautioned that objectivity may be compromised by the interview method because the interviewer takes up a position and judgements are then necessarily partial. I had to attempt a balance between this partial view and the advantage of interviews in providing a rich source of data in which sources of doubt, for example, not quite understanding the point which has been made, could be probed (although never challenged) and clarified. Rapport in this type of interview was taken to mean engagement with questions related to the business at hand, rather than social engagement. To this end, some flexibility in the interview was built in by including some open-ended questions and the opportunity to probe students' meanings. This design would be seen to stand between the unstructured and the structured types of interview (Wellington, 2000).

Much of the advice on interviewing (for example, Rubin and Rubin, 1995) stresses the need to listen to and not just hear the respondent. This helps to reduce the effects of positioning. Bogdan and Biklen (1992), express this in a chapter on qualitative fieldwork, which says:

Most important is the need to listen carefully. Listen to what people say.  
Bogdan and Biklen (1992) p.98

This useful advice was borne in mind when devising questions for the semi-structured interviews. A teacher from one of the participating schools sat in on two interviews with individuals (at a different school from her own), one boy and one girl, in order to monitor the integrity of the interview procedures.

On the basis of issues that students brought up in pilot interviews, and by consulting documents about the school calendar, decisions were made about the kinds of questions that would be asked in semi-structured interviews. The beginning of year 9 was the first sampling point, designed to establish a baseline of data and to introduce the students to the study. This was the most tightly structured of the interviews and this first interview yielded factual information, for example information about the processes involved in option

choice for GCSE courses, as well as information about students' ideas. In three subsequent interviews, at the end of years 9 and 10 and 11, questions were devised that were more open-ended so as to explore people's feelings and ideas about experiences connected with choice.

The questions to be asked at each of the four interview stages were informed by analysing the data from previous interviews. Analysis of responses from the first three semi-structured interviews began to build up a picture of each student's ideas about choice. In this way both the individual and the longitudinal dimensions were strengthened. For the last interview in year 11, I used a loosely-structured interview grounded in the responses of the students to three previous interviews. Interview questions, prompts and probes are presented in appendix A.

#### **4.2.2 Data Collection**

I aimed to minimise sample mortality and to generate a rich source of data by seeking to gain and maintain the goodwill and co-operation of the students who were asked to participate in four interviews over three years, even though taped data from individual interviews is simpler to attribute and to transcribe. I had built sufficient prompts and probes into interview schedules to deal with individual reticence or dominance so that students could feel comfortable enough to make unfettered contributions. Each student was asked to fill in a short preference form with 3 options: interview in a group of 3, individual interview, no preference. To accommodate the students' preferences the 12 students from each school were interviewed as 2 single-sex groups (3 boys and 3 girls in each group) and 6 individuals. Therefore, eight interviews were conducted in each school at each interview stage in year 9 and in year 10 (See Table 1). In year 11, I sought permission for, and was granted, an individual interview with each student. The year 11 interview gave time for students to reflect upon the experience of choice and also helped to validate previous responses. In 1996 I was alerted to the possibility that interpretation of the same events by researcher and researched may be different (Blatchford, 1996). I therefore resolved to seek clarification of points raised during the study to confirm emerging theory following analysis at each stage and I based the next

interviews on the patterns emerging from the data. It is an approach that could be described as retrospectively reflective.

To meet the need to follow students' ideas about post-16 choices, a longitudinal study was planned to enable data collection at intervals twice during year 9 and once at the end of years 10 and 11 of compulsory education. Data sampling points were chosen so as to gain sufficient data to be able to follow changes in students' ideas, to continue to 'feed' evolving theory and to be spread fairly regularly across the three years, whilst maintaining the goodwill of the schools. A longitudinal study is one that takes place over several years and a three-year data collection period was considered to be adequate to follow changes in students' ideas. Although a longer study would have revealed earlier ideas that may have affected choice, the time-span included two points of choice, one for GCSE option choices at the end of year 9 and the post-16 choice at the end of year 11. Students could be asked about their choices and how they thought factors in and out of school contributed to their ideas, with a particular emphasis on choice for or against science. Logistically data collection was just about feasible within the resources of a single part-time researcher.

#### **4.2.3 Sampling**

The sample was representative of students who were in the upper half of the attainment range and attending a comprehensive school in a medium-sized town in the mid-1990s. The sample was not nationally representative, but was chosen because schools from which the sample came were in the locality of the researcher. Resources, both human and financial, were inadequate to the task of collecting data across the full range of economic and social backgrounds, desirable though this would have been. The sample was selected so that data would be sensitive enough to capture aspects of the changes in students' ideas that were directly related to the logistics of choice in several schools with students for whom science could be a realistic post-16 choice.

There were 72 students in the original sample. Sample mortality was 4% in three years so that 69 out of the 72 students that I interviewed in year 9 took part in the whole study. The student sample was drawn from six different mixed-sex state comprehensive schools, one from the 11-18 and five from the

11-16 age range, with sixth-form colleges nearby. This constituted a multi-site study so as to improve the generalisability of findings, which would have been further improved by selecting schools from up and down the country. Cluster sampling with a small number of schools was a compromise. Generalisability was met, not in the sense of establishing whether findings are generalisable, but, as Bogdan and Biklen (1992) explain, rather with deciding to which other settings and subjects they were generalisable. Questions of generalisability applicable to a small-scale study are further dealt with in the concluding chapter.

The schools were situated in or within easy reach of a small town with a population of about 100,000 in an area of low unemployment, i.e. figures well below the 1996 national average of 9%, and in which 'hi-tech' industry forms an important part of the local economy. None of the schools would be classified as being in an area of social deprivation on the basis of the accepted indicator, namely pupil numbers granted free school meals, and therefore the sample was fairly homogeneous with respect to family social background.

The focus of the second research question about how students make science choices meant that the selection of the student sample was driven by the need to focus on a group of young people approaching post-16 choices, who may be capable of taking up science at post-16 level. An attempt was made to exclude from the sample those who may have rejected science on the basis of poor achievement in the subject at school. All schools approached had a pool of students who met the criteria, because their record of success in GCSE examinations was at least as good as, and generally better than, the national average. The criteria for entry to post-16 science subjects adopted by the majority of schools are a minimum of grade 'C' at GCSE and 5 GCSE grades at 'C' including mathematics. As a consequence, the group selected consisted of those pupils who met the above criteria and were judged by the Head of Science to be capable of at least two 'C' grades in double certificated GCSE science on the, admittedly, limited evidence of a student's current performance in science available at the beginning of year 9. The sample, then, is quite deliberately skewed towards the upper half of the potential science achievement range. The selection of the sample was validated by recording the end of Key Stage 3 SAT

score (government tests at the end of year 9) and GCSE grades in all subjects (including science) taken by each of the respondents.

### **4.3 Ethical Frameworks**

The majority of research workers like to think that they are operating within an ethical framework, in keeping with our values as educators. Moreover, researchers fear antagonising the institutions from whom they request access for fear of denial and the loss of a mutually respectful relationship. BERA (British Educational Research Association) laid down guidelines which were documented in 1989 and adopted at the 1992 AGM. BERA identified three ethical values when conducting research:

- Respect for persons
- Respect for truth
- Respect for democratic values

Ethical aspects of my research were carefully considered in the light of these values so that the rights of all participants were respected.

#### **4.3.1 Researcher and Researched**

Researchers confront dilemmas as to how they should present themselves to participants. Hockey (1986) became a “squaddie” in the army with the informed consent of the officers, but he carried out the research without the knowledge, let alone the consent, of the other “squaddies”. Therefore, many researchers will judge the research by Hockey to be unethical. I feel it is debatable, despite my own belief in the informed consent of the participants, whether such detailed information about the lives of “squaddies” could have been obtained in any other way. Scott (1996) identified opposite ends of the spectrum, so that at one end there is covert research and at the other end there is open democratic research. I adopted the open autocratic style of research, which lies between the two. Scott describes the open autocratic style not as clandestine, but as one which does not allow participants the rights of veto, obligating the researcher to protect the interests of those who have agreed to take part in the project.

In my research, I asked questions about choice, being particularly interested in choice with respect to science. I was totally honest about this when I wrote to

headteachers and contacted teachers about access to the school. When I wrote to parents for consent (see appendix B) and asked students for their personal consent to be interviewed, I told them that I was interested in students' comments about subjects in the curriculum. Honesty, I think, was maintained in this instance, because I was not just asking students about science during the interview, but also about other school curriculum subjects. This places my research in the open autocratic camp in which respondents are given a certain amount of information, but not the whole picture. In order to prevent bias I reasoned that I needed to avoid telling the students about the particular focus of the study on science, so that the students taking part in the study would regard science equally with all other subjects.

#### **4.3.2 Consent and Confidentiality**

I fulfilled the obligations of the open autocratic style of research by assuring anonymity when seeking consent from headteachers, parents and students on the basis that no school or student would be identified. The anonymity of the six schools from which students were drawn for my research was maintained, because the characteristics of individual schools were not described and the identity of individual students could not be traced back to any of the schools.

With respect to confidentiality, I have taken care to learn from Ball's (1981) experiences of the micro-politics of Beachside Comprehensive. Ball was criticised for targeting a particular member of staff who was easily recognised in the research report. Identification of one of the subjects of the study was considered by other members of staff to be unethical because it could be harmful to that teacher's career. This salutary reflection was borne in mind when I went into the six schools and guaranteed confidentiality to both schools and students. Ball remarked that he thought he had 'got it right' when one person's reported words were attributed to a 'marginal' member of staff and that person was, in fact, a head of department. I hoped also to avoid this sort of misappropriation because it can be just as harmful as attribution. I have therefore protected the identity of individual students by using pseudonyms.

A particular ethical issue concerns access to schools in the sense that the researcher has to make it absolutely clear how much access will be needed or, if

he/she does not know precisely, to explain the situation as clearly as possible. If the study is to take place over a considerable period of time I came to realise that access should be re-negotiated at each stage. I gained access to one school for a preliminary study, only to find that I was denied access for my interviewing, because I had not specifically negotiated that phase with the headteacher. Even though my contact at the school had made the same assumptions as I had, I simply withdrew because I did not consider it ethical to protest. I was able to find a substitute school at the last minute.

## **4.4 Procedures**

Having made the decision to conduct interviews with students at specific points over a three-year period, I scheduled four interviews per student over three years, identified a sample of 72 students in six schools and conducted the interviews. The transcribed raw data was coded and analysed with the help of HyperRESEARCH qualitative data analysis software.

The organisation of the study was methodologically informed, as described in section 4.1, and based upon considerations about design and ethics, as discussed in sections 4.2 and 4.3 respectively.

### **4.4.1 Pilots**

In the early stages of my research I gained access to a school where I undertook a pilot study. The pilot enabled me to work out how the research would be conducted, to learn about data gathering and to identify key issues. The earliest pilot interviews were conducted with two focus groups of six male and six female year 9 students. I (the interviewer) started off discussions with a question which students answered; fellow students in the group were then encouraged to discuss the comments made. The interviews were recorded and transcribed to familiarise myself with interview techniques, to evaluate the effectiveness of the questions and to explore potentially fruitful lines of enquiry. The aim was to begin to understand the concerns of students in their ninth year of school and to gain some idea of fruitful and not-so-fruitful lines of enquiry in relation to the research questions. At this stage I was inexperienced in both interviewing and analysis techniques. The pilot pointed to some logistical

problems and to limitations of talking to six people at once. The tape recordings had a high level of background noise and it was often difficult to distinguish who was talking at any one time. It was concluded that focus groups of six people would not give the clarity needed to follow the ideas of individual students longitudinally. The groups had to be smaller or maybe individual interviews would yield clearer data.

The recorded responses of the students were transcribed and scrutinized for potential lines of enquiry. On the basis of an elementary analysis of the first pilot interviews, I devised questions for the first interviews. The questions took into account students' ideas in relation to factors in the environment about which they had spoken in the pilot phase and known influences on student choice, as discussed in chapters 2 and 3. For example, some inclusion of KS3 SATs was indicated by the exchange below:

I. Would you like to make any general comments about your school?

Ans. You just get fed up with being told that you have got SATs coming up and then after that it's going to be GCSE looming. We don't need reminding all the time.

Since occupational aspirations among 13-16 year olds have been found to be fairly stable (Furlong and Biggart, 1999) I sought to include some exploration of students' ideas about certain occupations. I found in the first pilot that students had a variety of ideas about some types of professional people. In the first interviews, I asked about historians, business people and scientists, for example:

I. What sort of people become scientists?

Ans. White lab coat, sticking-up hair, slightly mad. An intelligent person you can have a conversation with, but their mind can wander off as you are talking to them.

I included questions about the three types of professionals in subsequent interviews because I thought it worthwhile to follow the possible changes in ideas about these occupations.

Issues which seemed to lack substance in the eyes of the majority of the students, such as images associated with teachers of particular subjects, were so thoroughly dismissed by all students that such lines of enquiry were clearly cold



trails. Responses to a question about science teachers and English teachers were similar right across the sample and typical answers are illustrated here:

I. Without mentioning how they teach, how would you describe the teachers in the science department?

Ans. In our department, they seem to be good friends. Science teachers are a bit more scatty about what they wear.

Ans. No different to anyone else.

I. How would you describe teachers in the English department?

Ans. English teachers are more carefully spoken. Well-spoken, more precise.

Ans. To tell the truth different departments don't have much of a specific impression.

Possible prompts and probes aimed at encouraging students to respond fully to questions were included to give students scope to explore their own thinking and to talk about their own concerns (see appendix A).

I sought to refine interview techniques by consulting a variety of texts, for example Fontana and Frey (1998); Kvale (1996); Radnor (1994) and Silverman (2000), and by using pre-interview pilot studies with a small group of students at each stage to practise and refine questions and to improve my interview technique for the semi-structured interviews. I looked at comprehensibility, clarity of meaning, content and order. The students who took part in the pilot interviews were volunteers from the same six schools in which research interviews were carried out. The volunteers were not told about the main study and they were recruited from the year above those for whom the questions were destined. These two precautions were aimed at preventing possible contamination of the data. Each interview pilot took place about a month before the interviews for the research and modified questions were then closely scrutinised for relevance and suitability with a colleague.

#### **4.4.2 Schedule of Empirical Work**

There are two points of choice which are written into the calendar of every secondary school in the England and Wales. The first is at the end of year 9 when option choices are made for GCSE courses and the second is towards the end of year 11 when choices are made about post-16 destinations. I felt that to collect data at these two points was appropriate because students have a heightened awareness of interaction with school factors at these times. Intrinsic

to decision-making at school are the careers education aspects of the school curriculum and the careers guidance provided by the local careers service to all secondary school students. Further known influences within the school system are the teaching and learning of National Curriculum subjects and option subjects, formal and informal interactions with teachers and fellow students and work experience\*. A work experience programme operated in each of the six schools from which the sample was selected.

On the basis of critical incidents for choice, I decided to interview students four times. First interviews were conducted in the first term of year 9, when pupils had not yet been given any official careers education or advice about Year 9 GCSE course options; a second round of interviews was conducted after GCSE course options had been chosen. Students were followed through to the end of year 10 and the final interview took place in year 11 when they had decided upon their future course of action, either work, training or post-16 education.

The first interview with students recently arrived into year 9 was carried out in the autumn of 1996 after students had experienced two years of specialist subject teaching in secondary school, but before they had made any major decisions. The second round of interviews, about eight months later, was structured to take into account concepts that had emerged in the first interviews against a context of SATS tests and choices about optional GCSE subjects in the summer of 1997.

Following analysis of interview transcripts from the year 9 interviews, a semi-structured interview schedule was devised for the third set of interviews in the spring of 1998 when the students were about half way through their GCSE courses towards the end of year 10. Year 11 interviews, which took place in the spring of 1999, were conducted when students had taken 'mock' GCSE examinations and had made their post-16 choices

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\* At the end of year 10 or the beginning of year 11 young people in state schools are usually out in the working community for two weeks as a compulsory part of their careers programme.'

Date	Procedure	Stage/ Year of study	Girls	Boys
February 1996	Focus groups in one pilot school	Post-option Year 9	6	6
March 1996	Focus group methods discussion	Year 10	3	
November 1996	Pre-option interview scrutiny	-	-	-
December 1996	Interviews 36 Individual. 12 Groups of 3	Pre-option Year 9	36	36
March 1997	Post-option interview scrutiny	-	-	-
March 1997	Pilot of post-option interviews	Year 10	2	1
May 1997	Interviews 36 Individual. 12 Groups of 3	Post-option Year 9	36	36
April 1998	Year 10 interview scrutiny	-	-	-
April 1998	Pilot of year 10 interviews	Year 11	1	2
May 1998	Interviews. 36 Individual. 10 Groups of 3. 2 Groups of 2.	Year 10	35	35
May 1998	Peer evaluation of interview procedure	Year 10	1/35	1/35
January 1999	Pilot of year 11 interviews	Sixth form	3	3
March 1999	Interviews 69 Individual	Year 11	35	34

Table 1 Stages of the Empirical Study

An outline of the timescale of the stages of the empirical study and the origin of the transcripts generated is given in Table 1.

#### **4.4.3. Access**

The initial contact with the school was made by letter to the head of science in five schools and to the head of careers, who was also a science teacher, in the sixth school. The project was explained to the contact person and in each case they generously gave their agreement to help with identifying a sample and distributing letters of introduction to parents and students.

The head of science at each school suggested 30 names, according to the achievement level at the beginning of year 9; of these half were girls and half were boys. 6 students of each sex from each school were randomly selected from an alphabetical list by the researcher giving a total stratified random sample of 72 students. Selected students were asked if they would participate in a study about curriculum subjects at school and they all agreed. The sample then falls into neither the volunteer nor the conscript category, but into the *willing conscript* category (Scott, 1996). 6 Boys and 6 girls from each school were interviewed four times.

Access to students was requested, subject to the formal permission of the head teacher of the school, and this was granted in each case. One head teacher asked for an outline of the research proposal and this was sent forthwith.

The parents of the 72 students who were to participate in the study were sent a letter of introduction and an invitation for their son or daughter, whose oral agreement had already been given, to take part in the study. The first interviews were to be conducted when the students were only 13 - 14 years old and a letter to their parents was essential protocol. A copy of the letter is included as appendix B.

Once parents or carers had given permission for their child to be involved in the study, the contact teacher spoke to the selected pupils at each school. A brief introduction to the time-scale of the study was given and an interview

time suggested. In four schools letters were placed in registers with the co-operation of form tutors and in two schools letters were distributed by the person I had originally contacted. An interview reminder was put into registers the day before the interview as an 'aide memoire' for the students.

#### **4.4.4 Conduct of Interviews**

In considering interviews with young people the structural aspects of the interview situation have to be clearly defined, even if it is to include a significant proportion of time to give free rein to their own concerns. The interview requires the researcher and interviewee to construct and maintain mutual understanding.

The interviews were all conducted in a small and comfortable room, either the careers office or the head of year office in the school where the respondent was a pupil. The SCRE (Scottish Council for Research In Education) guide to interviewing recommends going into the interviewee's own environment because the interview takes place in the context of the events to be discussed and useful field notes can be made to enrich the context of the data (Drever, 1995). The SCRE publication proved to be a useful reference source for deciding about the type of interview and in planning the operational details of data collection.

I tried to do as much as I possibly could to make the subjects feel comfortable because they were quite young when the first interviews took place. I had a very heightened awareness of the need to make it clear that I was interested in their personal opinions and ideas so as to be able to follow, on a longitudinal basis, the formation of each student's ideas about post-16 choice. The importance of their opinion was reiterated at the beginning of each interview stage. I also asked the respondents not to mention teachers by name and, in their enthusiasm to illustrate points; they had sometimes to be reminded of my request.

Interviews were tape-recorded so as to be able to hear the data at a later stage without filtering it as well as concentrating on interviewing techniques. The question of confidentiality was raised and before every interview and I made a point of asking permission to record it. I was in the position of having

an entire sample of students who consented without reservation to the interview being recorded.

## **4.5 Analysis**

The purpose of analysis of the primary data was to learn how students represented themselves during decision-making and to go beyond descriptions of attitudes to school subjects and career preferences found in other research (as discussed in the two preceding chapters).

Following the procedures of grounded theory, the outcomes of analysis were used to identify emerging concepts that fed into the next part of the study at each interview stage (described in section 4.2.1). All interviews were transcribed and, using the entire data set, the analysis proceeded to develop an explanation of the choice phenomenon from the point of view of the student engaged in making the choice. This in turn created a way of talking about choice that achieved a deeper understanding about what was involved when 16 year olds made decisions about their future.

### **4.5.1 Procedures of Grounded Theory**

The aim was not only to be able to look into the ways that students talked about choice, but also to try to account for the way(s) in which secondary school students viewed the formation of their choices. I wanted to interpret the data to find out what students conveyed about their own role in the decision-making process in order to uncover the thinking behind the choices that they made for post-compulsory education.

I analysed the transcripts of the four sets of interviews that had taken place periodically over three-years, in a way that showed how the students operated as social actors according to their own accounts. Such an analysis was explanatory in the post-positivist sense, challenging the idea that the language which was used by the respondents was a simple statement of facts. As Usher (1995) explains:

Research is a practice of 'linguaging' where language is not conceived as a mirror held up to the world, as simply a transparent vehicle for

conveying the meaning of an independent, external world, but which actively constructs a 'world' to be investigated.

Usher (1995), p 20

Adopting the procedures of grounded theory provided a method of analysis that was interpretive rather than descriptive. From the first interviews I used my analysis to generate concepts that could be used in data gathering in the next interviews and contribute to the longitudinal dimension. Glazer and Strauss (1967) explained the grounded theory approach to analysis in terms of procedures that aim to develop theory that explains as well as describes. They demonstrated how qualitative analysis could be taken further in order to go beyond description.

..... some of our best monographs based on qualitative data indicate that they can be a very rich medium for discovering grounded theory. In these monographs, discovery cannot be stopped, but breaks through both verifications and conceptual schemes .....

Glazer and Strauss (1967), p.185

The above statement applied to research undertaken in the 1960's which purported to be descriptive, but from which theory had emerged. The process of analysis was begun by breaking down and sorting the data (in this case, interview data) into 'categories' in a process referred to, according to the canons of grounded theory, as 'open coding'.

To capture the conceptualising, examining and categorising, which goes on during the initial phase when data was read and re-read, I was engaged in constant 'memo writing', putting down thoughts that perhaps related to codes or to emerging concepts. Memo writing is the beginning of data elaboration and, as such, represented the first steps in analysis. On this basis theorising began with the transcription of interview tapes when thoughts that occurred were noted. If new ideas emerged that could be validated in the data, then new concepts were identified and used for coding. Strauss and Corbin (1990) provided a detailed elaboration of grounded theory, which made it clear how the procedures of grounded theory, namely coding, categorising and theorising force the researcher to break through her/his assumptions.

Theoretical sensitivity has its origins in the analysis of data and, therefore, I constantly reviewed concepts that emerged from interviews in year 9, as the

longitudinal study proceeded. Some concepts had to be modified during the data collection, analysis, concept formation and data collection cycle.

Theorising was guided by exploration of what was found in the data, so that some sections of prose in the data were coded and re-coded as analysis proceeded, and data were reconsidered in the light of emerging concepts or patterns.

#### **4.5.2 Discourse Analysis**

The description of the procedures of grounded theory in the 1960s made the intrinsic assumption that theory will 'emerge' from the data (Glazer and Strauss, 1967). This notion has been criticized on the basis that theory is implicit in the data, which are never theory-neutral. Silverman (1993), for example, commented that there has to be some basis for considering the ways in which what is known might be organised. Hutchinson's (1998) description of grounded theory was of a strategy in which researchers go to the participants in an attempt to understand how participants see the world, and then proceed to discover the basic social processes or structures that organise their world. This aim of finding structure is not articulated in the original description of grounded theory by Glazer and Strauss (1967) and makes the whole enterprise of following the procedures of grounded theory seem less free and flexible than originally claimed. Analysis, therefore, may begin with a point of view about what the data represents. My view was that, when young people in the present study talk about choice, they are constructing an account which represents navigation into adulthood by increasing self-definition and self-direction as discussed in 3.1.3. Therefore, discourse analysis, as advocated by Potter and Wetherell (1987), provided an appropriate analytical perspective, because the central question in discourse analysis is: How is discourse put together and what is gained from this construction?

A person's language, according to discourse analysis, is more variable than indicated by studies in which descriptions and explanations of events are held to be valid, if they are similar across different people's accounts, because of the assumption that people actually construct versions of their social world. This assumption was useful in a longitudinal study because the discourse analysts



working from a perspective of post-structuralism\* aimed to pay more attention to language use and the process of change itself whilst maintaining the importance of underlying structure.

The basic theoretical thrust of discourse analysis is the argument that people's talk fulfils many functions and has varying effects. This allows for different versions of events in the social world of different people within a group. The secondary school students in the present study may go through similar experiences leading to post-16 choices, but their version of that experience may be different. Discourse analysis does not try to resolve the variation between accounts, but tries to make that variation a way into analysis. Plewis (1985) reminds us that, when no changes occur over time, longitudinal stability may also be a useful change indicator. Stability of students' ideas over time would be significant in the present research.

Since discourse analysis aims to reveal inconsistencies and differences as well as patterns, the interviewer is obliged to attempt to adopt a neutral position, so as to minimise the effect of the researcher on the data. The extreme position of observer neutrality is to adopt a strategy in which the observer becomes part of the scenario to be studied. It was neither feasible nor desirable for me to immerse myself in the life of the students for three years, as would be required for an ethnographic study. I was examining one specific aspect of students' experiences at school and, therefore, interval data collection was a justifiable compromise.

When we speak to respondents as researchers, we do not know whether informants themselves are selective about their experiences when responding to the interview questions, deliberately or unwittingly, and we do not know whether respondents give us their whole experience (Miles and Huberman, 1994). Since discourse analysis is based upon the idea that events are constructed from pre-existing linguistic resources, construction implies active selection and some resources are included and some omitted (Potter and

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\* Potter and Wetherell (1987) identify one of the earliest influences in discourse analysis as Chomskian linguistics, which differentiated speech acts from performance of speech, combined with the semiotic tradition in which language use is not seen only as a naming process but always dependent on a system of relationships. The use of discourse analysis to develop theory evolved in sociological studies because semiotic analysis was thought to produce static idealised descriptions.

Wetherell, 1987). In a profound sense, accounts construct reality. We have to recognise this as a limitation of any survey method and accept that we gather those aspects of participants' experience that they select in representing themselves to the researcher. The point of the analysis was to generate theory. If students constructed their version of reality differently in the context of decision-making, then this was part of theoretical development.

### **4.5.3. Analytical Procedures**

Periodic data collection was an essential feature of the longitudinal design that would enable me to follow students' ideas over time. By adopting grounded theory procedures, data collection and analysis of data were interdependent. Therefore transcription of the first interviews and memo writing, where the researcher puts down thoughts and ideas as they occur, along with preliminary coding, were the beginning of the emergence of indicators that might help explain students' ideas about their future choices. Interview questions were informed and justified by analysis of the previous interviews, designed and trialled at each stage (as documented in sections 4.2.1, 4.4.1 and 4.4.2) by procedures that resulted in a continuously iterative data collection and analysis procedure.

Wragg (1984) commented that in studies which rely predominantly on interviewing a good part of the work involves building a relationship, the respondent getting to know the interviewer and the interviewer putting the respondent at ease. Some of the earliest responses indicated that the students reacted as if they were involved in a school inspection. Responses were often stilted, apologetic or hesitant and sometimes defensive of their school.

I. Which subjects are related/connected to each other?

Ans. Er. I can't really think of any.

I. Would you like to make any comments about any of your school subjects?

Ans. Well, I think that everybody at school is doing their best to see that we have a good education!

These elements were less detectable in subsequent interviews. As I became more experienced as an interviewer a more productive relationship with the students developed. The year 11 transcripts gave more fluent and richer data

than the prior interviews. Students became more forthright with their own comments after the first interview, as if they had, by then, fully accepted that it was their own opinion that was sought. The change in the quality of the data is likely to be, at least in part, because students were accustomed to participating in the study and were familiar with the researcher. As they gained in maturity they became more able to articulate their ideas and to describe their part within the decision-making processes. Internal consistency of the data was checked in the year 11 interviews by confirmation of what students had said in earlier interviews and the way in which they prioritised factors that affected their choices.

After the year 11 interviews had been transcribed, data were treated as a complete data set and all data were appraised. Codes were confirmed or recoded to capture the longitudinal dimension. Concepts about longitudinal changes that were grounded in the data could 'earn' their way into theory and, by addressing the personal concerns of each interviewee, changes in their ideas could be followed.

#### **4.5.3(a) Coding**

When all data had been collected, I separated out the words of individual students from group interviews. The data were sorted into 279 individual data units, comprising students' responses for each of the 4 interviews. The data set for each of the 69 students comprised four interview transcripts, 'in vivo' codes, memos and tentative concepts formed during analysis.

I read the data collected over three years right through from beginning to end, so as to further capture longitudinal patterns involved in choice. This gave a strong 'feel' for the data and a basis upon which to begin to refine data coding. I was struck by the sheer variety of the way that individual students spoke about their positioning with respect to choice. Upon a second reading, I began to see that the complexity of the ways in which students chose and that the variety of recurrent preoccupations that they talked about would need to be identified and linked in the analysis. To this end I used HyperRESEARCH qualitative data analysis software to assist classification of analytic categories (coding) and hypothesis testing. HyperRESEARCH is basically a database of coded

information from which parts of the data can be extracted in a multitude of ways. I chose to set it up so that each student was considered to be one of the 'cases' in the study, much like creating a datasheet in a database. Each case was given a code, so case STG2 would be the second girl to be interviewed at St. Trinian's school. The fields in the database were codes that had been applied to sections of the data. The composition of the data set is represented in Table 2. A drop in these numbers indicates when students were not able to continue because they had left the school.

The 'in vivo' codes are phrases or ideas used repeatedly by informants to depict students' appreciation of the decision-making process and their reactions. Miles and Huberman (1994) would describe the codes as post-defined codes, but like guided or a priori codes they were subject to revision. After data collection and transcription, coding was refined for each student one by one up to the total of the 69 students who had continued to be respondents throughout the study.

A full list of codes used in the analysis with an explanation for each code is listed in appendix C. Coding segments of the data served the purpose of data reduction, so that when people said the same things but in a different way a single code was applied. By breaking down the interview data into coded segments, similarities and differences in students' talk was followed, and by assembling codes in different ways the longitudinal patterning of choice was examined.

One 'in vivo' code related to student opinion about the various mechanisms in place for post-16 choice in year 11.

I: Tell me about the schools approach to choices about post-16 (after this year)

Ans: They had loads of booklets and brochures on the different colleges.

They gave them out and the form teacher went through them.

Year/ Stage of Study	School BO		School CO		School NH		School PS		School SB		School SW	
	BOG1 – BOG6	BOB1 – BOB6	COG1 – COG6	COB1 – COB6	NHG1 – NHG6	NHB1 – NHB6	PSG1 – PSG6	PSB1 – PSB6	SBG1 – SBG6	SBB1 – SBB6	SWG1 – SWG6	SWB1 – SWB6
Year 9/ pre-option	6	6	6	6	6	6	6	6	6	6	6	6
Year 9 / post-option	6	6	6	6	6	6	6	6	6	6	6	6
Year 10	6	6	6	5	6	6	6	6	6	6	5	6
Year 11	6	6	6	5	6	6	6	6	6	6	4	6

**Table 2. The composition of the data set.**

N.B. Shaded figures represent numbers of interview transcripts

This response was assigned the code *<information about post-16>*. The data showed how the school operates to inform students about sixth-form colleges. They are related to context and not to the way that students construct their pathway to post-16 choices. This kind of coding is limited in the sense that it does not go beyond a panoramic view of some aspects of a student's school experience. This 'in vivo' coding is useful in finding out the school procedures associated with students' post-16 choices. These types of code helped me to begin to pick out the context in which students were operating.

The next step of the analysis was codes to marked passages (Glazer and Strauss, 1967). This was a creative enterprise on the part of the researcher who, according to the method of discourse analysis, had to search beyond attitude and behaviour to convey the sense of how exactly the student constructed their reality and what associations were being made. Upon re-examination of the example above we see that the student was telling us about more than school procedures.

I: Tell me about the school's approach to choices about post-16 (after this year)

Ans: They had loads of booklets and brochures on the different colleges. They gave them out and the form teacher went through them.

None of the subject teachers spoke to you and nobody gave you any encouragement. It was a lot different from options.

The second part of the extract conveys, not the school's approach to choices to post-16, but the student's dissatisfaction with the level of help. This was coded *<disappointment aspect choosing>*. This puts the first part of the text in a different light because the student follows that statement with a comparison with (year 9) options and, therefore, is telling us about the nature of the help received. The code for the first part of the selected data was revised to *<help with choice described>*. The 'in vivo' example code above *<information about post-16>* was also re-assigned the descriptive code *<help with choice described>* for the purpose of this analysis.

Discourse analysis also makes us pay attention to context in representing what the subject is conveying. As this was a longitudinal study, I had coded the data from previous interviews and was able to take prior knowledge of the student into account and thereby convey meaning with a descriptive code. Take,

for example, the student who says that he worked in a kitchen on work experience.

I: Where did you go for work experience. What was it like?

Ans: I worked in the kitchens in one of the colleges. I worked on salads and puddings and main dishes.

What we see on the page is an account of what the student did during work experience, but what he implies, judged from contextual information, was that the experience was positive because he had previously said that his ambition was to go into catering. His comment was coded *<work experience positive>* and so the code is descriptive. Eventually, there were so few positive comments in the whole group that the code became *<work experience comment>*.

The longitudinal dimension was ever present in the analysis. The code *<liking for subject>*, for example, did not stand alone as a concept. However, when a student expressed a liking for a subject at each interview stage, followed by a decision to take a particular post-16 course, consistency in liking a subject can be seen to contribute to the decision. One girl, who mentioned that she enjoyed art in the first interview, chose art as an option subject for GCSE, went to a design studio for work experience and chose art as one of her A-levels.

The delineation of sections of texts has to be considered to develop a coherent theory from the codes. The response in the section of data below would be split into two parts (here indicated by /) because the text related to two different emerging concepts.

I: Did you think about doing sciences or a science post-16?

Ans: I don't seem to be the sort of person who could do science after I leave school./ I would like to get Cs so that I can show a reasonable level in all the subjects/.

The code for the first part of the response was about her self-image in relation to science *<self as sci neg>*. The second part was about what people can achieve and was coded *<nurture talent possible>*.

In some instances two codes were assigned to the same response.

I: When you are being taught about careers, what sort of thing do you want to know about?

Ans: Money. Qualifications for different jobs in the area I want to work in.

The above response was coded as both *<factor of future importance>* and *<expected from careers>*.

Codes can be manipulated to make any changes that facilitate the analysis; for example, a code may only be assigned to one or two pieces of text and could reasonably be subsumed under an existing code. An illustration of this is that very little of the data could be coded *<help from mentor>*, so this was included into the wider code *<help with choice described>*.

When it was impossible to code with the available codes, a new one was added or an existing one was expanded to accommodate the response. By the time all the interviews had been coded no new codes were emerging. A data sample from each of the four interviews showing memos, in vivo codes and descriptive codes is shown in appendix D.

After coding, the next phase of analysis is the search for patterns in the data and differences or consistencies in either content or form of the accounts that can lead to theoretical developments (the main objective of both grounded theory and discourse analysis) in the area of secondary students' choice.

#### **4.5.3(b). Searching For Patterns**

I continued to develop theory by clustering codes and referring to the concepts that have been noted throughout the data collection, concept formation and data collection cycles. I examined recurrent themes in the data by clustering codes into five categories using the 'analyse codes' facility of HyperRESEARCH, a facility that displayed text (primary data) in the form of a report on codes and cases chosen.

The code clusters that were developed pertained to the six themes listed below. The descriptive codes included in each theme are presented in Table 3. The themes were:

1. Ideas about school subjects
2. Influential people
3. The dynamics of choice
4. Certainty about post-16 choice
5. Ideas about science.
6. Choices and how described



<b>Descriptive Codes</b>	<b>Code Cluster</b>
antipathy to subject/criticism of subj teaching/ curr subj use imptce/ good subject teaching comment/ mathematics one right answer/ opin compuls subjs Ys10 and 11/ reflectns abt stertping /SATS comment about/ seen as a difficult subject/ subj not int or enj/ subject interesting enjoyable/ subject not useful/ subjects connected	Ideas about school subjects
discouraged/ encouraged to pursue subject/ famil validn choi/ friends involvement in choice/ help with choice described/ strong contin infl on choice/ teacher role in choice/ work experience comment	Influential people
disappointment aspect choosing/ expected from school/ factor of future importance/ gender specific for subjects/ insinuate people diff abils / nurture talent possible/ optns nt crucial career dirctn/ outside infl choice/ predicted grades infl choice/ self valid choice/ self worthiness/ subject teaching informs choice	The dynamics of choice
Ahead mainly shrt trm/ anti coll or school post16/ automatic to do A-level/ career in mind?/ careers in mind several/ confid in ctrl own choice/ intellectual challenge wanted/ open minded re choice/rejects GNVQ/ unexpected yr 11 choice	Certainty about post-16 choice
d. science in rel to post16/ never considered science/ school has 3 sciences option/ school no 3 sciences opt/ science as a school subject/ scientific enterprise/ self as scitist pos/ self as scitist neg /image business person/ image historian/ image scientist	Ideas about science
anxiety expressed/ chooses a lighter subj/ chooses art and design/ chooses GNVQ/ chooses mixed A-levels/ chooses modern apprenticeship/ chooses new subj/ chooses non science A- levels/ chooses science A -levels/ broad choice described A -levels	Choices and how described
comment school ethos/ suggestions for improvement	Miscellany

**Table 3 Descriptive Codes and Code Cluster**

The themes were:

1. Ideas about school subjects
2. Influential people
3. The dynamics of choice
4. Certainty about post-16 choice
5. Ideas about science.

Choices and how described

Two descriptive codes did not fit into the scheme, but were allocated to a miscellaneous group, in case they proved useful.

Each code cluster was examined for each case (student) in relation to the way that ideas changed. Using the qualitative analysis software codes were selected and followed through from year 9 to year 11 and the data identified (which year and for which student) to enable tracking of individual longitudinal patterns from year 9 to year 11. Some coded sections of interview data from each interview are as shown in the sample analysis in appendix D.

I tested for patterns in students' ideas with respect to the usefulness and interest of school subjects. A reduction in liking for science was detected over time, but I found little individual variation in the pattern of this change, not even when matched against the student's choice with respect to science. I concluded that I needed to discover variations in students' ideas as a way to further the analysis. There was also a discourse of doubt among students about the usefulness of learning foreign languages, but again not patterned in any regular way and not relevant to what I wanted to find out about choice (see 4.5.2). In other subjects there was wide individual variation in school subject likes and dislikes, but the changes in these likes and dislikes did not follow a perceptible pattern across three years. Fewer than half the sample of students was positive about a subject or subjects throughout the three-year study and a positive attitude could be matched to their post-16 choice(s). In a similar way to other studies that reach such conclusions, analysis in this way did not account for the people who showed no favour towards a subject or subjects over three years.

There was a random distribution of people that students recognised as having impacted on their ideas throughout the study, although the way in which parents validated choice for both option selections in year 9 and for post-16 choices for the majority of students was notable.

The cluster concerning the dynamics of choice proved to be quite complex so I extracted a subsidiary cluster relating to students' assumptions and assembled all data for that cluster to see whether there was variation or consistency in the discourse of assumptions in relation to choice.

The following codes were selected from the cluster and followed through the three years of the study:

*<expected from school>, <expected from careers>, <expected from teachers>, <gender specific for subjects>, <insinuate people different abilities>, <nurture talent possible>, <role of teacher pass exams>*

There were some patterns associated with the lowering of the expectations of students concerning the support systems for choice over time. These changes did not go far enough in answering questions about how ideas about choice itself changed during three years. This dimension could be a peripheral, but not a central, part of analytical developments.

Using the fourth cluster of codes that related to the concept of certainty about the post-16 choice that a student would make, I tested the longitudinal variation in how open-minded or otherwise students were about their choices and how decided or undecided they were about post-16 choices using the codes:

*<ahead mainly short term>, <automatic to do A-level>, <career in mind?>, <career in mind several>, <open minded re-choice>.*

Of the themes in the code clusters explored longitudinally, this was the one for which the data gave the strongest differences in the patterning across the last three years of secondary education. A specific longitudinal pattern in the underpinning of the student's ideas about further study or a future career was detected in the data for each case (student). Differences in the ideas that formed choices varied from focused thinking about a definite career idea throughout the last three years of compulsory education, to a discourse about the necessity to maintain breadth in post-16 choices. Therefore, the concept of longitudinal variations in the discourse about students' projected ideas and resolution about

post-16 choices spanned a spectrum of individual variation that earned a place as the central concept in the analysis. The emerging pattern began to answer the first research question about the way in which students' ideas changed as they approached post-16 choices. Appendix E shows how the analysis proceeded by applying the descriptive code cluster named 'Certainty about post-16 choice' to the data set for student NHG1, who described a 'funnelling identifier' trajectory and for student BOG2 who described a 'partially resolved' trajectory.

The fifth code cluster was clearly related to sciences. As described in chapter 3, I decided to examine general decision making before moving on to the specific case of science. Although this cluster was an essential part of the analysis, to answer the second research question about how changes in students' ideas were related to science choices, it had less potential for explaining the broader basis of choices.

The sixth cluster was about the actual point of choice, the culmination of the choice process and not the process itself. The complexity of the data was such that it was not possible to relate changes of ideas on a longitudinal basis to every code cluster that was created. The lack of any longitudinal dimension for this cluster made it unsuitable as a basis of analysis, but it was useful for relating longitudinal changes to the actual choices that students made.

#### **4.5.3(c) Forming A Hypothesis**

Once variations in the longitudinal patterning of individual ideas had been located in the data and tested against the data set for each individual student, the final phase of analysis consisted of forming hypotheses about the functions and effects of the patterns found. Potter and Wetherell (1987) describe this as an examination of the way that people use language to construct versions of their social world. The construction emerged as the participants tried to make sense of a phenomenon or engaged in unselfconscious social activities, such as justifying or complaining. At the base of the constructions that students in the present study made was the concept of resolution about choice, which varied according to the individual pathways that they followed in order to arrive at their choices.

People engage in taking perspectives and reasoning about probability when thinking about their future. Ideas change over time according to what developmental psychologists call a 'life course trajectory' (Demetriou, Doise and vanLieshout, 1998). The idea of the trajectory was applied to the variability of students' discourse about choice resolution, and the hypothesis that each student had an individual trajectory as they approached post-16 choices began to emerge.

## **4.6 In Summary**

In this chapter I have documented the way in which a longitudinal, qualitative, small-scale study was developed in order to meet the demands of the first research question that changes in an individual student's ideas be followed over time. The selection of a sample of students in the upper half of the potential achievement range met the requirements of the second research question, which deals with the way in which students' changes of ideas relate to choices about science. The influence of the methodological considerations of grounded theory led to an iterative process of data collection and analysis, which informed further data collection at each stage over three years.

The pertinence of discourse analysis as an analytical tool in the interpretation of data within the procedures of grounded theory is explained by using examples to point out the importance of the purpose, rather than just the descriptive nature, of talk. Discourse analysis provided a perspective that unearthed the meaning of students' talk, which permitted the researcher to go beyond simple descriptions of the logistics of choice in school. The basis upon which choices were made and students' reactions to the process of choice were revealed. Analytical procedures, involving coding, code clustering and hypothesis testing, showed that there were differences in students' ideas over three years. Crucially, discourse analysis was used to try to make the variation between accounts a way into analysis. This resulted in the evolution of concepts about the deeper layers of the different ways in which 16 year olds make choices about post-compulsory education.

Ethical aspects of carrying out a study with young people from secondary schools were carefully considered and a respectful and productive relationship

was established with everybody involved. Questions of generalisability were raised in order to begin to consider the limits of generalising from the sample. The value of a small-scale study in giving a textured explanation about students' ideas about choice was recognised.

Analysis of the data revealed variations in the formation of students' ideas about post-16 choices and this was conceptualised as differences in students' *choice trajectories*. The concept of choice trajectories was the basis of theoretical development, documented in chapter 5, which began to explain longitudinal differences among students in the personal construction of choice. Further indicators of the variation of individual choice trajectories, which were discovered by deeper analysis and theoretical elaboration, are reported in chapter 6.

## **Chapter 5. Findings: Routes Of Choice**

### **5.1 Choice Trajectories**

The aim of the research was not to pinpoint a particular attitude to school subjects or careers, for example, the masculine image of science careers noted by Whitehead (1996); neither was the aim to make cause and effect connections about choice as discussed in chapter 2, for example, Dekkers' (1992) work which attributed gender-specific choices to the sexist advice of parents. Rather, the aim of the present research was to understand students' discourses over time, to explain what shaped their decisions and to examine how they conveyed the experiences that led them to post-16 decision-making at school.

The preceding chapter described the way in which variability in students' discourse about choice over time was detected as patterns in the data, leading to the development of the concept of choice trajectories. This variability points to a depth and individuality in the way that students make choices, which has been difficult to detect in the cohort studies that have mainly reported on data trends.

Marcia's (1980) approach to defining career identity in terms of more than one identity state informed the present analysis. Marcia's analysis of what he called occupation identity in late adolescence was modelled in four modes (for details see section 3.1.2), which were defined in terms of the time at which identity crisis and commitment were observed. I have established that there are several, not just one, routes to choice for high achieving students in mid-adolescence. Marcia's categorisation of identity construction gave a theoretical guide to the development of a typology for the variations in the time-scale over which students' post-16 decisions were made. Identity was seen to be constructed over time and viewed as an

.... internal, self-constructed, dynamic organisation of drives, abilities, beliefs and individual history.

Marcia expressed caution about the formation of an identity as the definitive feature of the termination of adolescence.

It has been shown by a number of researchers that identity achievement is unlikely to occur much before the age of 18, whereas my data collection period ended when students were 16. Coleman and Hendry (1999) report that when Archer (1982) and Adams *et al.* (1996) looked at identity achievement in the middle adolescent years (the years of the respondents in the present study), they found few consistent differences in the very limited degree of identity achievement that was found. The present work, therefore, does not presume to talk about identity achievement but about the period of self-examination that may take place during the mid-adolescent period, which leads up to the eventual formation of an adult identity some years into the future. Therefore, the in-depth interviews with students in this study have generated data over three years, which have been used to indicate the longitudinal variation in ideas in the mid-adolescent or the pre-identity resolution phase.

Analysis of the data revealed differences in the longitudinal pattern of individual students' ideas when they were forming post-16 choices. This was conceptualised as a variation in choice trajectories, characterised in different ways. A focused trajectory was described by the student who had one established idea by the beginning of year 9, which was pursued into post-16 choices. A student, who gave little indication of subject or career preferences throughout the last three years of school and whose post-16 choice was made out of the necessity to choose what they would do when they finished compulsory schooling, described a diffuse trajectory of choice.

In order to be able to theorise about student choice in a manageable way, the individual trajectories of the 69 interviewees were clustered to form a *typology of choice trajectories*, which acted as a device to aid theoretical development. Each typological group comprised trajectories that were similar in the longitudinal patterning of students' ideas, underpinned by the degree of resolution about post-16 choices.



The typological groups were titled and incorporated into the data as a descriptor for identification of a choice trajectory for each student in the study. The typology of trajectories formed the basis of and simplified the analysis in order to illuminate the ways in which post-16 choices were formed. Further analysis that will be developed in chapter 6 examined the operation of the dynamics of choice within and among the typological groups.

## **5.2 The Typology Of Trajectories**

There were five groups in the typology, which were distinguished by the way that the choice trajectories were shaped when students were between 13 and 16 years old, the age at which decisions were made. The basis of the typology and the differences between the typological groups (and numbers of students who have that particular choice trajectory/total number of 69 students) are first given in outline.

### **1. DIRECTED (15)**

From the outset of the study students with a 'directed' trajectory had narrowly focused ideas formed by a critical decision to pursue a career path from which they did not waiver.

### **2. PARTIALLY RESOLVED (16)**

The 'partially resolved' trajectory exemplified the ideas of a student with a strong leaning towards a subject or narrow group of subjects throughout years 9, 10 and 11. The trajectory of these students was broader than that for the students with a 'directed' trajectory since the students' ideas were within a 'choice zone', a limited number of closely-related subjects. Students with a 'directed' trajectory had placed the majority of subjects beyond consideration, but they had not made an early, narrow commitment to a specific career.

### **3. FUNNELLING IDENTIFIER (16)**

Students with a 'funnelling identifier' trajectory identified with a wide range of subjects or an assortment of career ideas at the beginning of year 9, but they

gradually came to firmer and firmer conclusions about further study options as time went by.

Unlike students with a 'directed' and 'partially resolved' trajectory who commit themselves narrowly, students with a 'funnelling identifier' trajectory show a reluctance to eliminate any subject from their future choices. Over quite some time they increasingly narrow down their thinking, giving a trajectory that can be visualised as a funnel, narrowing as they go towards making a choice in the middle of year 11.

#### **4. MULTIPLE PROJECTION (9)**

The 'multiple projection' trajectory is divergent over most of the three years leading to post-16 choices. The trajectory splits into several pathways as students visit a range of career possibilities over time, with convergence occurring during year 11 when a choice is made. The students with the three trajectories outlined above showed a degree of resolution during the course of the last three years of compulsory schooling, whereas the students with a 'multiple projection' type of trajectory did not show any resolution by the end of year 10. Unlike the students with a 'precipitating' trajectory, they had no reservations about the choice that they made in Year 11, which committed them to three A-levels, GNVQs or a mixture of both.

#### **5. PRECIPITATING (13)**

Students with a 'precipitating' trajectory found choice at 16 years old to be very difficult, because they were reluctant to narrow down their preparation for the adult world to a job, vocational course or a limited number of A-levels at the age of 16. When these students eventually made their decision, it was an important moment.

### **5.3 Typological Analysis**

An analysis of the data, in terms of the indicators that gave shape to each choice trajectory outlined above, is given here.

### **5.3.1 The Directed Trajectory**

For the 15 students who had a 'directed' trajectory choice was seen to be driven by an idea, which was established by the beginning of year 9 when the first interview took place. The student with a 'directed' trajectory favoured a school subject with a vocational bias such as art or PE, or they had a career in mind. They held unwaveringly onto this one idea, which was eventually pursued into the choices made at 16. Rarely did the student say that they had strongly considered other possibilities.

Erica, for example, had a clear career intention by the end of year 9.

I: On what basis have you chosen your options?

Erica: PE, I chose because I really love PE and I want to be a PE teacher.

Erica continued to follow the idea to be a PE teacher throughout years 9, 10 and 11 and went on to sixth form to do A-levels in sports science, mathematics and social biology and AS level in German.

Similarly, Kieran had made up his mind about his future career. From an early age he was resolved to become a marine archaeological geophysicist. He was asked about his year 9 option choices.

I: On what basis have you chosen your options?

Kieran: All the subjects I took for the job I want to do. A marine archaeological geophysicist.

I: What does the job entail?

Kieran: It's the people who go down to a sunken ship and identify the finds. You have to know about the underground geology of the area too.

Like Erica, Kieran stuck to one idea which directed his choice at 16. He went on to study A-level in history, geology and classical civilisations, subjects that he had found out were appropriate to prepare him for his long-chosen career.

At each interview over the three years of the study the 15 students with a 'directed' group trajectory showed a continuous interest in a specific career pathway, which had a dominating and predictable influence on the decisions that they made at 16. At the pre-option stage in year 9 Fiona related the questions she was asked to her ambition to be a lawyer.

I: Which subjects help with other subjects?

Fiona: History would help a lot of other subjects. It would be useful in quite a few careers, I want to be a lawyer and I think it would be useful for that.

Fiona chose her year 9 option subjects on the basis of the career she had in mind and was questioned in year 10 about her continued interest in law.

I: Do you still have the idea to do law?

Fiona: Yes, it might be a dream, but I think I can do it!

By year 11 she had looked up quite a lot of information about law.

I: What have you had in the way of careers education?

Fiona: Our form teacher introduced us to the careers library, and I got some information from the library, and it tells you what courses to take and some of the subjects that can help you. It has got everything! There are all sorts of law, civil suits and family disputes, lots of things.

Another student, typical of those with a 'directed' trajectory, was Adele who had a firm view of her future career when interviewed at the pre-option stage.

I: Have you had any ideas about what you would like to do after you leave school?

Adele: Something with art and technology.

Then in year 10, Adele slightly modified her ideas, but with art still a certainty.

I: What have you considered doing after you GCSEs?

Adele: Going to college to do the art and design course.

Adele was accepted for an art and design course in further education. Greg showed determination similar to Adele's to pursue a particular career path from an early age and he was keen to do something connected with sports. In the middle years of secondary school he talked about physiotherapy and eventually chose BTEC National Diploma in sports studies.

The majority of students with a 'directed' choice trajectory described how they projected a specific ambition into the future. Mark M and Thomas E were typical in having ideas about the work they thought they would do as adults.

I: How far ahead are you thinking?

Mark M: I've been talking to a friend of mine, who is also going to do catering, about owning our own restaurant. The business side could come later.

I: What do you think you will be doing in ten years time?

Thomas E: I hope I'll be working for a club, probably in the USA. Could be football, basketball or American football.

Hannah had made up her mind to do something in medicine and she raised her ambition within medicine as she got older. In the post-option interview towards the end of year 9 she was asked:

I: What ideas do you have about what you would like to do when you leave school?

Hannah: Yes, I want to go to college and I want to become a paramedic.

By year 11 Hannah was thinking about the closely-related profession of a medical doctor.

In the year 10 interview

I: What have you considered doing after your GCSE's?

Hannah: I am going to do A-levels. I am too young to start my paramedic training.

Then in year 11.

I: Tell me how you chose your A-levels.

Hannah: I talked to my science teacher about doing medicine. I was given advice about biology and chemistry, but I was unsure about doing physics or maths.

In establishing the typology it had to be accepted that each student's trajectory matched the criteria for a group in the typology more or less closely, depending upon the group in which the trajectory could be placed. Hannah's trajectory was slightly less directed than the majority of the student choice trajectories in the 'directed' group. However, she described her trajectory in terms that were sufficiently focused to be classified in the 'directed' type of trajectory, rather than the 'partially resolved' type.

The long-term view of working life adopted by these students demonstrated an early vocational projection for which preparation started at school. This gave a choice trajectory that was precisely targeted and narrowly directed towards achievement of a specific goal over three years.

### **5.3.2 The Partially Resolved Trajectory**

People who had a 'partially resolved' trajectory clearly identified with clusters of subjects, towards which their thinking was orientated. These sixteen students had a choice trajectory that was guided by a sphere of interest, but not as narrowly as the specific career direction of the 'directed' trajectory. The students were partially resolved about a particular career direction, which often, but not always, crystallised in the last year of compulsory schooling.

The students in this trajectory group usually had a favourite subject or the germ of a career idea from the initial stages of the study, although, unlike the 'directed' group, they did not make consistent statements about having a specific subject or career prospect in mind. Their partial resolution can be described as an idea or ideas, which they had at the back of their minds over the three years of the study, revealed in responses to questions, but which they themselves did not declare as the central plank of their thinking about choice. Unlike students with a 'directed' trajectory, they considered other possibilities, although in each case there was evidence that a thread of partial resolution was present that could be followed in their responses during interviews over three years.

Although Rachel D talked about the potential of mathematics from the first interview, she had not decided that mathematics would be a definite future choice. She had a trajectory that was 'partially resolved', as evidenced by her consistent reference to mathematics as a possible future subject choice and by placing some other options like English and sciences outside her realm of possibilities.

I: What ideas do you have about what you'd like to do when you leave school?

Rachel D: I put something financial on a careers form. I do like maths.

A year later in year 10 Rachel D spoke of mathematics again.

I: Do you have any ideas about what you want to do as a career?

Rachel D: I don't really have an idea like some people. I only thought of accounting because someone told me that I was good at maths, so maybe I can do something with maths.

In year 11

I: Tell me how you chose your A-levels.

Rachel D: I enjoy maths so I thought it could lead me to something financial. I cut out English and sciences early on because I am not so interested in the kind of thing that they can lead to.

Rachel D had the typical 'partially resolved' trajectory in having strong but unspecific career leanings.

Mary expressed uncertainty about what she wanted to do in the future, but several times during the study she showed a bias towards physical science.

At the beginning of year 9:

I: What subjects might be useful for a career?

Mary: Science, most jobs you need to know about electricity. Not chemistry and biology as much, mainly physics.

After year 9 options:

I: On what basis have you chosen your options?

Mary: The electronics I took because I did not like any of the others and it was more scientific really.

I: What sorts of things do you like doing in science?

Mary: I'm quite interested in physics. I like brain and behaviour.

In year 10:

Mary: I like maths because that's what I can do well in. I can do physics, but it isn't very interesting.

In year 11:

I: When did you think about doing science?

Mary: I have always been good at physics. I can see things.

Abi chose English, sociology and media studies at A- level following a 'partially resolved' trajectory between year 9 and year 11, when she expressed an interest in working in the media. Abi's interest was already apparent in year 9

I: What ideas do you have about what you'd like to do when you leave school?

Abi: I'd like to be a behind-the-scenes worker in television.

Her favourite subjects in year 10 were English and drama and she continued to think of a career in the media.

Abi: Not in the performing, but something in TV or maybe radio.

Liz did not specify a broad area of work like Abi, but she had some closely-related ideas by the end of year 9 and eventually chose A-level subjects related to these early ideas.

I: Have you had any ideas about what you'd like to do after you leave school?

Liz: Interior designer, graphic designer or advertising - something related to that.

In year 10 Liz was asked what she had considered doing after her GCSEs.

Liz: Definitely A-levels if I make the grade. Theatre studies. For a serious subject I thought of English literature.

I: Do you have any ideas about what you want to do as a career?

Liz: I know what I want to be. I want to be an artist, maybe graphics. I thought about advertising art, but A-levels are quite limited when it comes to art. I have looked up all sorts of things you can do with art and graphics.

The ideas of most students with a 'partially resolved' trajectory closely conformed to the trajectory profile throughout the three years of the study. Two students, Jonathan and Kester, did not focus on a discrete area of interest before year 10, placing their trajectories more towards the 'funnelling identifier' type of trajectory during the first two years of the study, with a 'partially resolved' trajectory type evident at a later stage from the end of year 10. Their choice trajectories were therefore classified in the 'partially resolved' group because the choice trajectory nearer the point of choice determined the choices made. Throughout year 9 Jonathan stated that he had no ideas about what he would do when he left school, but by the end of year 10, he had come to a decision.

I: What have you considered doing after your GCSEs?

Jonathan: Probably going into engineering.

Jonathan chose work-based engineering training at the end of year 11. Kester's ideas also began to show resolution in year 10, but up to then he hadn't considered his future.

At the end of year 9.

I: Have you decided against taking any of your school subjects after you leave school?

Kester: No, I haven't thought about it much.

When interviewed at the end of year 10.

I: What have you learnt in science that might help in the future?

Kester: I might need physics in my career.

I: Can you think of any particular people who could continue with science if they wanted to.

Kester: Well I am! And a few others.

Subjects of interest to the student were usually identified over time by a combination of partial resolution and negative selection or antipathy, dismissing the possibility of continuing with a subject or subjects somewhere between years 9 and 11, and apparently never re-examining the prospect. For example, by the end of year 9 Abi had resolved not to take mathematics in the future.

I: Have you decided against taking any of your school subjects after you leave school?

Abi: Maths! I really can't see myself as a maths person.



Before option choices Will was asked about science.

I: Which topics do you find most interesting in science?

Will: I'm very interested in biology and I like chemistry too.

After option choices Will was veering towards mathematics and English.

I: Did you choose subjects with post-16 in mind?

Will: Yes. Most of them. Some I might want to do for A-level and some are just strong subjects. I might well do maths and I'll probably do English.

By year 10 Will had decided on a pathway towards science and maths.

I: What have you considered doing after your GCSEs?

Will: Maths, because I think it will be useful in a lot of careers. I've always been good at maths. Also human biology, it's my favourite area of science and a third.... I'm not sure yet.

I don't think I want to do any languages, probably not Art. I haven't rejected art as a subject, but just for me. Probably not arts subjects.

These students based their choices on their self-construction as people with particular strengths, who made an early declaration about an interest in an area in which they felt competent, although in a less sharply-focused way than students with a 'directed' trajectory.

The trajectory of the students with a 'partially resolved' trajectory was more tentative than that of the student with a 'directed' trajectory, whose ideas about a direction post-16 were consistently focused over three years. A career direction or interest in a subject or subjects was often established before students were first interviewed at the beginning of year 9, but students with the 'partially resolved' trajectory tended to mould their preparation for post-16 choices by matching up, over time, aspirations with what they thought they would do best.

### **5.3.3 The Funnelling Identifier Trajectory**

The 16 students with the 'funnelling identifier' trajectory showed leanings towards related groups of subjects, which were even less focused than the two groups already described. There was a gradual focusing down of ideas over time as different possibilities within a broad 'domain of interest' or collection of subject areas were considered and reconsidered. The decision about a post-16

course of action was made after balancing the pros and cons of the different options within a broad but identifiable domain.

At the time of the first interview in year 9 Andrea started off with quite a broad perspective on her future. She declared herself to be more interested in arts-orientated subjects and mentioned a whole range of careers that might interest her, giving such examples as a government translator or a costume designer. In the first interview she mentioned acting several times, but cautiously.

I: What ideas have you had about what you'd like to be when you leave school?

Andrea: An actress, but saying that I know lots of actors and actresses who haven't got very far and are on the dole half the time, and that's not what I want to do. Other than that I'd like to be an accountant.

She continued to be pragmatic in her approach.

I: Have you any ideas about what you'd like to do when you leave school?

Andrea: Not completely fixed, because there are probably careers that I haven't even heard of. Maybe something connected with performing arts.

In the year 11 interview she explained how she managed to narrow down her choices.

I: Tell me how you chose your A-levels.

Andrea: I was really unsure. I thought about each of the subjects carefully and I was still only down to about eight! I read all the brochures. I considered history just because I thought it would be interesting to do as I hadn't done history since year 9. Then I realised I did not really have a motive for doing it more than psychology or sociology. I had a hard time deciding between sociology and psychology. In the end I read a lot of things to do with psychology and I thought it was really good so I fixed on psychology. I have a lot of training in performing arts so I chose that A-level.

I: What do you think you will be doing in ten years time?

Andrea: An international lawyer living in Paris.

Carl also had several possible career ideas in mind such as professional footballer, journalist, chef and something in business. He established his domain of interest in the light of antipathy to sciences.

After option choices at the end of year 9:

I: What subjects would you not take if you had a free choice?

Carl: I would ditch chemistry. In a way you are not going to need that if you are not going to be a scientist.

A similar viewpoint was expressed in year 10:

I: Any subjects you have rejected for after GCSE?

Carl: Oh, definitely all the sciences. Straight out of the window.

Joseph, in contrast, liked science right from the outset of the study, but he also enjoyed PE, geography and technology. He chose geography over history for year 9 options.

I: On what basis have you chosen your options?

Joseph: I wouldn't choose history because I don't think it's as useful as geography because geography is more science.

I: What have you had in the way of careers education?

Joseph: We went to the resource centre to look up jobs. I wanted something that involved science. I looked at forensic science. There were different areas of forensic science like reconstructing crashes. You don't have to do things like cutting up. I don't know much about science jobs. I wouldn't like to do anything like chemistry or something.

In year 11 Joseph decided to study A-level physics, chemistry and mathematics.

Charlotte's trajectory was broad at first and converged quite gradually. In the pre- and post-option phases at the end of year 9 Charlotte described her diverse interests within the world of entertainment.

Charlotte: I'd like to be something to do with entertainment, music journalist, actor, singer, DJ, but you change all the time. When I was in year 5 I was convinced I was going to be a scientist and then I saw Jurassic Park and then I wanted to be an archaeologist.

By year 11 Charlotte had formed a focused ambition.

Charlotte: I wanted to pick good subjects to get me where I want to go. I want to be a film producer. I chose history and film studies because they are analytical in the way that I need to know.

Laura's trajectory developed into the 'funnelling identifier' trajectory from the end of year 10. During years 9 and 10 she had a clearly stated career idea to become a forensic scientist, which would have placed her trajectory in the 'directed' group. By the end of year 10 she changed her mind about forensic science and during year 11 she began to consider her options more broadly within the domain of health and social care. She made A-level choices that included a science, but which would not allow her to study forensic science. On the basis of the choice trajectory nearest to the time when she made her decision her trajectory was designated 'funnelling identifier'.

Students with a 'funnelling identifier' choice trajectory usually identified with a pathway which at the outset was fairly broad, but which possessed some level of identification with a group of subjects or careers. Most people progressively focused their ideas over three years, although for some the convergence had a more protracted time-scale.

### **5.3.4 The Multiple Projection Trajectory**

There were 9 students who had a trajectory that split into several directions. They responded positively to a wide range of subjects and expressed an interest in several different career directions or diverse school subjects at different times during the course of the three-year study. This group of students had a 'multiple projection' trajectory.

The trajectory of these people was distinguished from the 'funnelling identifier' trajectory by there being no consistent indication of a detectable thread of an idea in one direction or another. Their trajectories were different to those who had a 'precipitating' trajectory, considered below, because students with a 'multiple projection' trajectory eventually had definite subject or career ideas. They may have eliminated a particular subject earlier on, but from the wide-ranging considerations that were expressed about a future direction, it was not possible to predict their leanings during the course of years 9 and 10. Certainty only came at or near the point of choosing.

James B thought about becoming a vet in year 9 and a barrister in year 10. In year 11 he became interested in psychology because friends already in the sixth form were enjoying the subject.

I: Did you choose option subjects with post-16 in mind?

James B: Yes. My parents wanted me to make sure that I don't close things off.

I: Have you decided against taking any of your school subjects after you leave school?

James B: Probably not languages. Otherwise I haven't really.

James B was still interested in biology at the point of choosing, but decided upon psychology instead.

James B: I did consider biology because it's good to have a science A-level, but the psychology is counted as a science.

Michelle started off with a range of ideas in year 9.

Michelle: I either wanted to go into medicine or go into law or maybe something related to sport somewhere along those lines.

She continued to think about medicine and had also considered accountancy. However, between the end of year 10 and the middle of year 11 she had turned quite strongly against the idea of doing medicine.

I: You had an idea to be a doctor last year. What happened to that idea?

Michelle: I would prefer to be in an office than in a clinic. Anyway, I have a poor image of doctors. They seem so ignorant and so arrogant. I wouldn't want to fob people off like I have seen them do.

When students with a 'multiple projection' trajectory did make up their mind about their choices, they did so with certainty.

I: How far ahead are you thinking?

Michelle: I have my whole life planned! Good A-levels, straight to university to do finance and accounting.

David O did not have a career idea during the first interview at the beginning of year 9.

I: What ideas have you had about what you would like to do when you leave school?

David O: Well, go to college really, carry on after 16. I don't know what sort of area.

David O mentioned an interest in PE and leisure and tourism at the end of year 10 and said he would like to do something active.

I: What aspect of school has made you think about that?

David O: I haven't discussed it with my teachers, although I get the impression that my PE teacher would agree with me. The computerised career programme showed me some areas that I might look at, primary teaching and physiotherapy looked like possibilities. I was intending to follow them up, but I haven't got round to it yet.

By the middle of year 11 David O had decided to do the national diploma in public (uniformed) services in order to join the police force when he was older. Katherine showed a similar pattern to David in having visited a series of different career ideas including lawyer, vet and linguist before making a decision to study English literature, history and economics with a view to a business career.

I: What have you had in the way of careers education?

Katherine: A careers advisor came and talked to us about the careers library. I did not know which ones to go and look up.

I: Have you any ideas about what you'd like to do after you leave school?

Katherine: I'm still thinking about A- levels and a profession, maybe a linguist.

Year 10:

I: What have you considered doing after your GCSEs?

Katherine: English, I'd like to do history. Maths I'd quite like to do. I've been told I should do science. I'm quite good at science, I'm not sure.

Year 11:

I: How did you choose your A-levels?

Katherine: I discussed it a lot with my parents. My mum is director of operations in a company and I want to go into a business of some sort.

In year 9 Kimberley said that she had thought about becoming a scientist for quite a long time. She was very positive about science.

I: On what basis have you chosen your options?

Kimberley: I had my choice made for me. What I am good at. I am going to do something in science and I wanted to do geography because it is related.

In year 10 she still talked about science in a positive light, but imagined herself studying non-science subjects further.

I: What subjects might be useful for a career?

Kimberley: It depends on the person. For me history, English and humanities.

Kimberley was still considering several possible careers during year 11.

I: Tell me how you chose your A-levels

Kimberley: You have to think it out for yourself. Just about all the teachers wrote in the reports that I should do their subject at A-level. I want to be a lawyer for the United Nations. I want to work with people who need my services, not rich people. My other idea was to be a town planner. That comes from work we have done in geography and I really love geography.

The students with a 'multiple projection' trajectory viewed their post-16 decisions with certainty at the point of choosing. David had a clear idea of his career direction in the police by then; James B felt that by choosing psychology, English literature and history at A-level he had kept a range of options open; Kimberley spoke positively of the potential of geography, history and English. Sarah J had wanted to become a nurse in year 9 and thought that she would do a post-16 course in drama or art when she was in

year 10. In year 11 she chose advanced GNVQ in leisure and tourism and commented:

Sarah J: I actually chose the course at open evening at the college and it seemed to suit me.

Students with a 'multiple projection' trajectory arrived so decisively at their choices in year 11 that any courses of action, associated with previously considered subject or career possibilities were discarded apparently without regret.

### **5.3.5 The Precipitating Trajectory**

Students with a 'precipitating' trajectory tended to enjoy a wide variety of subjects and these 13 students were distinguished by a lack of any detectable leanings towards a domain of interest, a specific subject or any career direction throughout the three-year duration of the study.

I: Were there any subjects that you would like to continue, but you couldn't fit into your option choices?

Becky: Well I'd like to do PE and all the technologies. I also wish it would be possible to do French as well. I wish I could do all the subjects to GCSE level.

In year 10 the students with the 'precipitating' trajectory gave similar replies; for example, Ian and Richard:

I: Any subjects you have rejected for after GCSE?

Ian: All still open for me.

Richard: For me personally probably not French, but I am not sure yet.

The trajectory of choice was scattered, but was suddenly narrowed as the students met the course application deadlines just over midway through year 11. When these students made their decisions, it was usually with regret at having to choose so few subjects and, in strong contrast to the group of students with a 'multiple projection' trajectory, they remained dissatisfied with the narrowness of their choices. They felt that they were being forced to choose at the age of 16. They spent a considerable amount of time and effort in the selection of post-16 options, but choice was difficult because they saw the choice as a narrow one. Every student with this trajectory expressed a wish to be able to do more subjects in recognition that a broad choice of subjects would keep future options open.

I: Tell me how you chose your A-levels

Hester: There are just so many things that I wanted to do. It really is a difficult choice to make, because suddenly you are narrowing down so much.

Ben was typical of those who made a commitment to the A-level route, but who were sceptical or unsure of AS levels and advanced GNVQs.

I: Tell me about the school's approach to choices about post-16.

Ben: There was all the brochures from the sixth forms. They had a drama presentation about GNVQs. It was quite fun, but it still did not attract me to the idea of doing GNVQs. I am not really sure what they are.

There was a perception that A-levels were seen by sixth form colleges as a better route to higher education, despite proposals that were current during the period of data collection interviews (1996-1999) and implemented in 2000, namely to restructure A-levels on a broader base.

Hester: It isn't really possible to keep broad unless you do AS levels, which the sixth form colleges are not keen on.

Students with a 'precipitating' trajectory had, like Ellie, either no idea what they want to do by the time they had to make a choice in year 11 or, like Reuben, they started thinking about a wide range of possibilities.

I: Tell me about the school's approach for post-16.

Ellie: I went to about seven subjects to see what was on offer at the sixth-form colleges.

I: Tell me how you chose your A-levels.

Ellie: The choice was so wide. I did not really feel that I could choose the three. I did not want to do four A-levels and I get the impression that if you do AS you might as well do the full A-level.

I: Have you any ideas about what you'd like to do after you leave school?

Reuben: I have a few ideas. A banker has got a nice job. I wouldn't mind being a policeman for a time, see how I like that ..... or a pilot, that's an interesting job.

When Reuben finally made a choice, he had looked up several career pathways towards the end of year 11 and had found a combination of subjects which would give him entry to a range of openings.

I: Tell me how you chose your A-levels.

Reuben: Mostly I went with what I was good at, physics and maths, and not to narrow down the possibilities. I added psychology because they told me at sixth form interview that doing double maths at A-level was seen by universities as one and a half A-levels.

Breadth was also a consideration in Ben's subject choice.

I: Tell me about careers education.



Ben: No idea about a career. I thought about managerial work. I think my A-levels are broad enough and I can narrow down after. I've got a science and maths is a very flexible subject.

The students whose trajectory was 'precipitating' thought in terms of facilitating a range of future career decisions by selecting subjects at A-level that will leave a number of doors open. They were not vocationally orientated and were disappointed about the necessity to make decisions at this stage of their education. The scope of their post-16 decisions was wide in sharp contrast to those with a 'directed' choice trajectory, who talked about a specific vocational projection throughout the three years of the study and who made decisions that were accordingly narrow in scope.

## **5.4 The Heterogeneity Of Choice**

Students approaching decisions for post-16 education have usually been presented by other researchers as having similar positioning in relation to their choices in the years leading up to their decisions (Ainley, 1992; Bell, 1991; Cheng, 1995; Dekkers, 1992; Farrenga, 1999, Furlong, 1995; Stables, 1996; Wikeley, 1999). Discourses about choice among adolescents have generated an image of students who gradually identify with subjects or careers and then channel their strengths and interests in order to prepare themselves for further study of the appropriate post-16 course.

Relatively little is known about the way in which individuals form post-16 decisions over time. Studies, like those of Stables (1996) for example, found trends in the popularity of different subjects among students but individual differences were masked. In the present research, the analysis of interviews from the same sample of students over three years gave an opportunity to bring out any differences or similarities in changes in students' ideas over time. Following students' ideas about choice, from the beginning of year 9 until post-16 decisions were made, allowed an analysis of primary data from individual students that went deeper than the descriptions of trends in generalised pupils' views that have been reported. The analysis gave insights into the individual formation of choices among a group of above-average achieving students and explored the relationship between the formation of choices and attitudes to curriculum subjects.

The emerging model of a typology of choice trajectories presented in this work is based on assumptions about adolescent development as discussed in chapter 3. The typology clearly shows a variation in the positioning of students with respect to post-16 choices. Young people matched their self-image against potential future pathways in different ways so that the timing of commitment to post-16 choices was varied. Students were found to take a route to their choice that matched one of five types of trajectory. Each individual trajectory was dependent upon the ideas that students held about the ends for which they made choices.

Taking students' ideas into account, I have begun to travel further into the dynamics of choice. A complex picture has begun to emerge, where we see that students did not make decisions in the same way. I have demonstrated that when this group of students was engaged in decision-making in secondary school, they did not interpret the process in the same way and therefore choice was accomplished by different activities. Each school student had a particular trajectory by which they came to identify a post-16 direction.

Researchers, including Ball *et al.* (1995) and Brown (1999) have similarly challenged assumptions about the homogeneity of the way that people engage in particular activities. The work of Ball *et al.* (1995) on parental choice for secondary school found that parents were engaged in a different type of activity depending on the basis upon which the consideration for choice was made. Brown (1999) showed that parents engaged in supporting their children's work at home in the primary mathematics IMPACT project approached the task in different ways, depending on their interpretation of their parental role.

Students in the present study were also found to be engaged in different activities and approaches when choosing post-16 options. They may all have been introduced to the careers library, pursued various ideas and consulted teachers and friends, but the way in which their ideas changed was different depending on the ends for which their choices were being made. The activity in which those with a 'precipitating' trajectory were engaged was quite different from those in the 'directed' group, where choice was guided by a stable idea. The young people in the 'directed' group operated in a landscape dominated by a recognisable career idea, whereas in the 'partially resolved' group there was always present the seemingly unconscious thread of an idea to which they kept returning. Students with a 'funnelling identifier' trajectory roamed across a

less limited terrain, albeit a landscape restricted by their domain of interest, but nevertheless wide in comparison to those students with a 'directed' or a 'partially resolved' trajectory. Students with a 'multiple projection' or 'precipitating' trajectory formed their ideas in open country roaming across a broad landscape, the difference being that, in the former, several specific careers were considered and the decision once made was justified, whereas in the latter ideas were very broad and there was a tendency to keep re-examining the sweep of the terrain.

The trajectory of choice was affected by the degree of vocational projection (how committed students were to a particular career) involved in the decision-making. Students with a 'directed' and 'partially resolved' trajectory had already made a vocational decision, and their thinking over the last three years of school was steadily orientated towards facilitating entry into a particular career or subject area. The vocational element was weaker in the 'funnelling identifier' and 'multiple projection' trajectories. The 'precipitating' trajectory was characterised by a lack of vocational projection as students tried to keep open as many options as possible. This course of action was more in keeping with ideas which favoured a broad foundation for lifelong learning.

The groupings were related to those used by Marcia (1980) in the late 1970s. The sample for Marcia's research was representative of 15 year old adolescents who were either going on to O-level GCE or leaving school to go to work and about whom Marcia theorised in terms of arrival at an occupational identity, as discussed in chapter 3. However, in the present study, at the end of the twentieth century 25 years later, the specific details of Marcia's identity states seem inappropriate for this sample of high achieving students going on to continue their education post-16. The analysis gave a fine-grained representation with greater detail about the way that ideas were formed over three years during mid-adolescence and it seems unlikely from the evidence that Marcia's identity states will be recognisable in these students when they are older.

The work reported in this chapter has established that 69 students drawn from the upper half of the attainment range from six schools took different routes to their post-16 choices. These routes have been modelled as a typology of choice trajectories, which will form the basis of a more detailed, longitudinal exploration about the way in which choosing works for people with trajectories in different groups within the typology. In chapter 3 the developmental tasks of identity formation in adolescence

were discussed in terms of evaluation, self-organisation and decision-making and viewed as a dynamic model. The next chapter goes on to establish how students began to construct a career identity in different ways from a variety of sources. Table 4 in chapter 6 gives a comparison of some distinguishing features of the choice trajectories. As students formed their choices they selected influences to fashion the choice trajectory from material and human resources from what has been referred to by Ball *et al.* (1995) as 'the landscape of choice'.

## Chapter 6 Findings: Roots Of Choice

The development of a typology of choice trajectories established in the previous chapter demonstrated that there were differences in the *ends* for which post-16 choices were made. These differences gave rise to variation in focus and stability of student's ideas over time which, in turn, gave shape to five types of choice trajectory. The differences in the ends for which choice was made was found to echo the findings of Gewirtz *et al.* (1995) who found differences in the *ends* for which parents chose a school for their child. Choice of a school was an activity that was distinguished by the different *means* that parents employed, as well as the different ends.

Having established that the ends that mid-adolescent students had in mind for post-16 choice were related to their type of choice trajectory, the means by which the trajectories of choice are differently fashioned were the focus of further analytical elaboration. I aimed to complement and extend previous work that used large-scale questionnaire surveys about students' interest in and enjoyment of subjects, for example, Miller *et al.* (1999) and to extend the research to unearth the roots of choice in the dimensions and dynamics of the choice trajectory over three years. The next part of the analysis ventured further into the context in which ideas were formed over the time when decisions were being made. The means by which post-16 choices were made were found to vary depending on the type of choice trajectory.

### 6.1 Influences On Choice Formation: an Introduction

Influences, which are recognised to have an impact on choice within school, include form tutors\* and subject teachers. Perception of subjects, PSE (personal and social education) and careers education including the school careers teacher, and the local careers guidance service have also been found to play a part in student choice (Watson, McEwan and Dawson, 1994; Morris, 1995). The sample of students selected for use in this study was in the higher-attaining half of the student population, but anticipated achievement in school subject GCSEs may also have had affected their

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\* Teachers who register a group of students on a daily basis and who are responsible for their day-to-day welfare

anticipated achievement in school subject GCSEs may also have had affected their post-16 decisions. Outside school or, in the case of parents, at its margins influences may include news items or experiences in the social world of the student as Hawthorn (1996) discovered in her study of adults' retrospective views of career choice influences.

This analysis is approached from the point of view of the student in terms of the way in which students recognise influences that contribute to formation of post-16 decisions in the last three years at school, and what they say about the way that they use these influences. There may be influences that students do not recognise or which they do not articulate, although the methods described in chapter 4 were aimed at minimising such data losses. From those students whose choice trajectories were moulded by the aim of a specific career, to those whose aim was to keep open as many options as possible, an image was assembled of the ways in which each type of trajectory was constructed from the available resources in the landscape of school and home.

## **6.2 Choice Trajectories: Ways And Means.**

Each student described factors (and the time-scale over which these factors operated) which they considered to be the most pertinent influences on the formation of their ideas. The extent and effectiveness of and student response to identifiable and direct influences on choice varied according to their choice trajectory type. Students with a trajectory designated as 'directed' identified a prevailing influence on their decision about a post-16 destination, which came from a specific source; an influence which was pertinent, often crucial, to their ultimate choice after compulsory schooling. Students with a more open trajectory, the 'precipitated' type, identified no specific influences on the formation of their choice trajectory over three years. The pertinence of influences was therefore conceptualised as a dimension that varied according to the group to which individual choice trajectories belonged.

Each member of the group with a 'directed' trajectory was very clear about the inspiration for the career idea that was the lynchpin for the decisions upon which their future was based.

In Kieran's case, his imagination was captured by the discoveries of marine archaeologists that he knew about before he went to secondary school. In year 11 he was asked about his idea of becoming a marine archaeological geophysicist.

I: How did you first hear about this job?

Kieran: It must have started when I heard that they raised the Titanic when I was in primary school ... and the Mary Rose ... I know that I knew what I wanted to do by the time I came here from primary school.

Claire's interest was also sparked by a specific event. When asked in year 10:

I: Do you still have the same idea about a career?

Claire: I have thought about being a beautician for a long time.

I: Have you got any information from school or help from teachers to do with that?

Claire: It wasn't anything at school. It was when I went to a wedding a couple of years ago and they had beauticians to do all the facials and manicures for the bride and bridesmaids.

In the year 10 interviews Greg explained how he had heard about careers in sport.

I: You said in year 9 that you had thought about doing physiotherapy. Where did that idea come from?

Greg: I think it's because I like science and I like helping people and you always hear about physiotherapy if you do sports.

A strong interest in sports during the last three years of compulsory school was highly influential in Greg's eventual decision to study for a post-16 sports diploma.

In each case, the students whose trajectory was 'directed' by early resolve could identify a dominating influence which had fired their enthusiasm for a particular career.

The 16 students in the sample with a 'partially resolved' trajectory did not connect their ideas with a single prevailing influence. They often identified the sources of some of their ideas, not necessarily one critical source which would characterise the 'directed' trajectory, but experiences that evidently held some sway in the formation of their choice trajectory. Influences tended to have a positive effect on students' decisions, although sometimes their partial resolution came about because of antipathy towards a school subject or career idea rather than in a positive choice. Most students in this group had made enquiries about courses of action open to them.

Tom K had been to CERN and had hobbies that were relevant to his choices. In year 11 he chose mathematics, physics, computer science and media studies.

I: You said that something in particle physics might be fun. Where did that idea come from?

Tom K: When I went on holiday I visited CERN. I spoke to this scientist who worked on the particle accelerator. There was a football-sized cavern where it was all happening.

Tom K: My two main hobbies are computers and the media and I don't mean just watching! It would be nice if I could combine these in a career.

Daniel H did a lot of electronic music composition in his GCSE course and he had regularly attended an electronics club run by a teacher at school for three years. In year 10 he said:

Daniel H: The direction I will go has become clear over the last two years and I have done quite a bit of research in the library on different careers in music technology.

Rachel D explained in year 9 that she had become interested in business studies because she was given a computer for a present and she liked the idea of office work. In year 10 she talked about a similar area of interest.

I: What have you considered doing after your GCSEs?

Rachel D: Possibly going to university, maybe business studies.

Rachel chose business studies at A-level.

Tom W's responses demonstrated that his self-image did not correspond with the idea of continuing with some subjects. At the post-option stage in year 9:

I: Have you decided against taking any of your school subjects after you leave school?

Tom W: I can't imagine science or graphics. Otherwise I haven't really decided.

One positive influence on Tom W's choice of psychology as one of his A-levels was finding that he could help with his friends' problems, as he explained in year 10.

I: What have you considered doing after your GCSEs?

Tom W: I'd quite like to go on and study psychology. I think a lot of people explain their problems to me. I've always been interested in the way people think.

In year 11 Jonathan ascribed his decision to do work-based training in engineering to his positive work experience and to his father's encouragement.

Jonathan: I worked for an engineering firm on work experience, precision engineering. They made parts for microscopes. It was very interesting. I made a piece that they were going to sell.

Jonathan: My dad always thought that some sort of engineering would be a good idea and he has encouraged me.

John S had a strong identification with sciences

I: Any subjects you have rejected for after GCSEs?



John S: I haven't exactly rejected anything, but I think that I have always been on the science side. That doesn't mean that I won't choose media studies or something.

Students who showed the characteristic trajectory of 'partially resolved' had apparently not been influenced consciously by one major factor as had the 'directed' group, but in a more subtle way. From year 9 onwards these students began to pare away those areas against which they could not match their self-image and they selected an area of interest, the direction of which could be traced to one or two influences on the shaping of the choice trajectory. Individual students sought advice on the basis of their own interests and, apart from Carl whose business mentor had helped him to apply for a bank manager traineeship, the students with a 'partially resolved' trajectory were all keen to take A-levels.

The 16 students with a trajectory that matched that of the 'funnelling identifier' type did not talk about strong influences on the choices that they eventually made. They presented a picture of a mixture of influences to which they had paid some attention and a more gradual refinement of ideas (over the three-year interview period) than for the students with a 'partially resolved' trajectory.

Grace made a progressively more focused evaluation of different subjects against her own image of her capabilities and discarded possibilities along the way.

I: What sorts of things do you like doing in science?

Grace: I'm not much good at science, but I do like the practicals.

I: Which subjects do you find difficult?

Grace: Maths. I just haven't got a maths mind. My worst nightmare would be to have to re take maths.

Mark C, like several people in this group, had a variety of ideas, which could be seen to narrow down within a domain of interest. He saw one idea as a flight of fancy, but did heed some related suggestions from the CACP (Computer Assisted Careers Programme). In year 11 Mark was asked about an idea he had had at the beginning of year 9.

I: You thought about being a pilot. Did you look up any information about being a pilot?

Mark C: No, that was just a bit of dreaming at the time. I don't like flying much! I did think about doing mechanical engineering, but I don't think I am good enough to do A-levels in science.

I: You said that CACP came out with things like an AA man and an aero-mechanic. Was that useful?

Mark C: I might finish up doing either of them.

I: How have you decided on your course?

Mark C: I want an apprenticeship in motor mechanics. There is a booklet that you can get and it tells you about the companies in your area.

Shelley had a typical 'funnelling identifier' trajectory in gradually arriving at her decision to take advanced GNVQ leisure and tourism, mentioning ideas related to the sports and the leisure industry in each of the four interviews. Shelley thought that only two subjects were definitely not on her list of possibilities by the end of year 9.

I: Have you decided against taking any of your subjects after you leave school?

Shelley: German and music. I don't really fancy doing them later. Everything else is open.

In years 9 and 10 Laura's trajectory was less typical of the 'funnelling identifier' type because she had an idea about a career in forensic science, identified as the result of the strong influence of a television series about forensic scientists. She was not clear about a specific career within forensic science and by the end of year 10 her thinking had widened; then during year 11 it narrowed progressively in the manner of the 'funnelling identifier' trajectory. The latter part of the trajectory determined her post-16 subject choices.

Between students with a choice trajectory of 'partial resolution', who closed off options early, and those with a 'multiple projection' type of trajectory, who resisted closing off options early, came those students with a 'funnelling identifier' trajectory, some of whom would and some of whom would not close off options early. Within the 'funnelling identifier' group were students who showed a conflict, and sometimes confusion, between an affinity with an area of interest and a belief in keeping options open. The 'funnelling identifier' choice trajectory converged more slowly over time in a less clearly-defined way than that of the 'directed' or 'partially resolved'. Students may have expressed negative feelings about a subject as a result of experiences of that subject in school, but they felt that discarding subjects early might be detrimental to their future aspirations. They seemed torn between what they ought to think and their own ideas.

Carl, for example, in year 9:

I: Have you decided against taking any of your school subjects after you leave school?

Carl: I would like to give up science.

In year 10, despite his explicit antipathy, Carl still hesitated to dismiss any subject completely.

Carl: If someone told me that I needed to do chemistry for a job that I wanted, I would think about it!

Charlotte, who by year 9 strongly considered something in the media, had similar reservations to those of Carl and still wanted to keep possibilities open in year 9.

Charlotte: I think you should keep your options open. Suppose I decide I want to be a vet and if I had dropped biology I would think 'Oh, no I can't be a vet!'

In year 10, however, antipathy towards mathematics and science influenced Charlotte's choice trajectory.

I: Are there any subjects that you personally would drop given the choice?

Charlotte: Yes! I hate maths and science! I hate subjects with set answers.

Joseph and Clemency also hesitated to discard subjects.

I: Any subjects you have rejected for after GCSEs?

Joseph: I haven't rejected anything totally. I suppose I could suddenly start liking French and then become exceptionally good at it!

Clemency: I would say maths and science, but if I want to do technical things then I will probably have to keep up physics.

Paradoxically students in this group had the most negative views about the subjects with which they did not feel an affinity, despite the caution expressed in the comments above. They seemed to have a schooled understanding but no real commitment to maintaining broad options.

Carl was vehement in year 10

I: Any subjects you have rejected for after GCSE?

Carl: Oh, definitely science, straight out the window.

After considering leisure and tourism Sarah R opted for an NVQ hotel reception course. In year 10 Sarah R had discarded science as a potential post-16 idea, as she explained in the year 11 interview. Sarah R's trajectory conformed to that of the 'funnelling identifier' although she was unusual among students with that trajectory in expressing no reservations about discarding options.

I: You said that if you had a choice you wouldn't do sciences. How do you feel about that now?

Sarah R: I still think so. I could be doing something which would help me with my career. Science isn't useful.

Most students in the group with a 'funnelling identifier' trajectory said they were open-minded about what choices they would make. They showed some flexibility in their outlook and were cautious about a narrow commitment, even whilst expressing hostility towards some subjects. The trajectory was partly formed by negative selection and partly by a predisposition towards a broader domain of interest than the trajectory of 'partial resolution'. Students often expressed their interests in terms of subject clusters such as performing arts (including dance, music and drama), or humanities (including history, geography, RE and sociology) or sciences (including geology, biology, chemistry and physics).

Students with a 'multiple projection' trajectory typically considered a wide variety of possible post-16 destinations without reference to a domain of interest. These students considered the options in a much broader landscape than the three groups of students described above. Their trajectory was fragmented by influences from many sources, as they envisaged themselves in different roles.

Eddie found science interesting in year 9.

Eddie: Science is quite an interesting subject, especially electronics. I could see myself doing something like fixing a computer.

In year 10 he had considered working in food technology because of ideas he had seen at school.

Eddie: In food we have a list of jobs, which shows you what you can do with food technology. I'd be interested in some of them.

In the formation of the latter part of a 'multiple projection' trajectory, the main influences on students were the accessibility of the A-level courses, the nature of the course work and their potential for achieving good grades. Eddie decided that mathematics was too hard to be considered for further study and that he was too young to go in one direction with the GNVQ engineering course. He chose to study geography, business studies and design technology.

The 'multiple projection' trajectory resolved into a single pathway during year 11, although each student was previously unaware where their ideas would lead. No conscious appreciation of any particular influence on their choice was apparent, but they had drawn from a variety of sources in the landscape of school and beyond. Most of these students considered themselves to be acting proactively when following up some of their ideas and subject interests during year 11. Some students eventually made decisions based on approaches to people involved in certain careers.

Michelle had a trajectory that was 'multiple projection', having considered medicine, law and accountancy. In year 11 she made enquiries about routes into accountancy.

Michelle: I have had quite a lot of information about accountancy from my Aunt and I know that you can do a degree. I have found out lots about accountancy in the careers library.

David O. made an appointment to see the local police recruitment officer and was impressed by the detailed advice that she gave. Sarah had asked about training in leisure and tourism when she went to do her work experience and Eddie had asked for advice from his friend's mother about business studies.

The 'multiple projection' trajectory was shaped by the students' exploration of a variety of ideas from a broad range of school subjects or careers, which were favoured at different times in the three years leading to post-16 choices. The impression that they held of a particular career and/or the quality of advice that they were given were significant factors in the post-16 decisions of students with a 'multiple projection' trajectory.

For students with a trajectory in the 'precipitating' group the choice trajectory was ill-defined, as decisions at 16 were not considered very much in years 9 and 10. Year 11 was suddenly a very active time for choice when options were considered and reconsidered, giving a sudden sharp definition to the trajectory at the point of choice far later than for any other choice trajectory. Each member of the group with a 'precipitating' trajectory saw their choice in terms of an academic direction and did not have a set career direction in mind. Typically in year 10:

I: Do you have any ideas about what you want to do as a career?

Richard: No, nothing specific.  
Becky: I don't really know.

Any indications of a career idea were tentative.

Hester: Even if I don't become an archaeologist I have lots of other things to choose.

I: Have you any ideas about what you'd like to do when you leave school?

Rachel B: Not much. I had thought about marine biology.

Students with a 'precipitating' trajectory were characteristically confident, positive and open-minded about their future. Rachel B was alone in having rejected an area of work because of her own family history.

I: Did you think about doing science post-16?

Rachel B: I know what I want to do and I am sick of hearing about science at home.

All wanted to study a selection of A-levels that were broadly based to prepare them for different career possibilities.

Martin: I have been interested in electronics for years. The sixth form did not think that I should do electronics with politics, English and geography.

The final question of the year 11 interviews, which probed future projection, gave an insight into the breadth of students' thinking.

I: What do you think you will be doing in ten years time?

Richard: I have no idea. That's what makes it so exciting

David B: No idea. Some sort of job.

Hester: I'll be doing a job that I am interested in and I still want to do.

The ways in which students made decisions for post-16 pathways in terms of prevailing influences varied according to the type of choice trajectory over time. The student with a 'directed' trajectory recognised a powerful trigger to their interest in a specific career and over three years orientated their efforts towards achieving a fixed goal. The student with the 'partially resolved' trajectory had well-developed ideas about their particular interests and mentions an array of influences to which they had paid particular attention. The trajectory of the 'funnelling identifier' offered a similar longitudinal profile to the 'partially resolved', but was moulded from a broader range of options and influences and narrowed down over a longer period of time. It is among students in the 'funnelling identifier' group that most negative selection took place as they gradually pared away their options. In both the groups of students

with ‘multiple projection’ and ‘precipitating’ trajectories ideas about a career were not decisively influenced and their ideas about post-16 were, in each case bar one, subject-dominated.

## **6.3 Choice Trajectories: the Landscape**

In the first part of this chapter variety in choice trajectory, as described in chapter 5, has been linked with difference in the strength of influences that have proved to be critical to students’ post-16 choices. The manner in which choice trajectories were associated with different dimensions of decision-making is now considered by further exploration in the affective domain in order to examine features in the landscape of choice that may have shaped decisions about post-16 education. The ways in which influences from the landscape of choice were utilised was examined and related to the choice trajectories so that the dynamics of choice became clearer.

Features in the landscape of choice that students considered to be key influences on their ideas over time, such as teachers, parents or the students’ experience of school subjects, are discussed in turn.

### **6.3.1 Teachers**

Attitudinal research has shown that subject teachers have not been seen to have a proactive role in the guidance of choice (Milner, 1987; Sharp et al, 1996; Munro, 2000). Students interviewed in this study made the observation that teachers endorsed, rather than assisted, their decisions wherever their trajectory was located in the typology. However, the time when students consulted their teachers showed a temporal variation in relation to the choice trajectory. Among students with a ‘directed’ trajectory there was a strong tendency to seek teachers’ advice earlier in the secondary years than with other trajectories.

Early in year 9 Liz, with a ‘partially resolved’ trajectory had made enquiries of subject teachers within an established zone of choice.

I: What have you found out about careers from subject teachers?

Liz: I have asked my teacher about drama courses and my ceramics teacher about design. They gave me information about media studies and art and design.

Joanne had not consulted with teachers until year 11, which was typical of a 'multiple projection' trajectory.

Joanne: I chose biology and I told my biology teacher and she was pleased about that. There was nothing about geography.

In the year 11 interviews Carl summarised the feelings of the majority of the students, irrespective of their choice trajectory.

Carl: They have been reacting to our choices, not contributing to our choices.

Teachers were seen to be particularly willing to endorse a decision about their own subject.

Ellie: My English teacher agreed with my choice. The teachers left you to make your own decision.

Teachers were prepared to advise about subjects other than their own when asked a specific question.

Charlotte: It's good to have a language with business studies. I spoke to my business studies teacher.

Fiona: I went to see my teachers. They are always available. My English teacher was very encouraging. She told me that sociology needs good English too.

Those students who were not prepared to make active approaches to teachers often expressed disappointment about the low profile of teachers' involvement in their choices.

In year 11, Mark M and Claire with a 'directed' trajectory

Mark M: None of the teachers spoke to you and nobody gave you any encouragement.

Claire: I think my form teacher might know what I chose, but no one else is interested.

Students quite strongly indicated a viewpoint that the job of the teacher was to teach the subject matter, not to be involved in students' decision-making.

Clemency (funnelling identifier): The subject teachers don't get involved in careers, they seem to have enough to do with GCSE work.

Whilst the work of teachers on the academic and pastoral curriculum was appreciated, students would still have liked teachers to be more encouraging.



Nathan (partially resolved): The teachers don't say 'I think you would be good at this' or anything, but if you ask them they usually say yes to your idea.

Joseph (funnelling identifier): There wasn't any particular encouragement from any of the teachers.

Although subject teachers were happy to endorse the decisions that students made, they seemed to be unprepared to deal with requests for personal advice.

Mary: I did not get any answers to 'are these right for me?' The teachers just say yes because of my predicted grades.

Students appreciated teacher approval of their choices.

Hester (precipitating): I told my biology teacher that I was doing biology and she was very pleased even though she hadn't said anything before.

Students felt that teachers spoke in general terms about the value of their own subject, but they did not usually discuss the careers potential of their subject area.

Jonathan D (partially resolved): They might mention that, say, maths is important in a lot of jobs.

Mark C (funnelling identifier): Teachers did assemblies to encourage you to do their subject if you could cope.

When asked about what careers they had heard about in lessons:

Andrea (funnelling identifier): They may tell us that maths may be useful for example in graphics. I can't really think of any times when they take it beyond the A-level stage.

Simon (precipitating): Our French teacher put a poster up about careers with languages.

Claire (directed): No, they don't tell us anything.

Several students speculated that teachers did not seem to be involved in the decisions at 16 because they did not have a vested interest.

David B (precipitating): The teachers don't get involved like they did in options. Then it was like they were on commission.

The form teacher, who had a pastoral role in each of the schools, was not seen as somebody who contributed to the students' choice trajectories. The form teacher's role in choice was seen to be in the logistics of applying for the post-16 phase, giving advice about procedures like filling in forms for employment or for sixth form, but not to be involved in decision-making.

Clemency (funnelling identifier): The form teacher is more for pastoral care. Things like if your parents split up and it affects your schoolwork.

Claire (directed): I know what I want to do so I chose the one that looked best. I think my form teacher might know what I chose, but no one else in school is interested.

The subject teachers' role was seen to be one of endorsement of choice and a contribution by way of a recommendation as to whether a student, in the teacher's opinion, was capable of taking their subject further. Neither subject nor form teachers were seen to have a proactive role in shaping the choice trajectory. Students communicated a clear understanding that it was the teacher's job to help them gain the highest possible GCSE grades and from the students' point of view it was this aspect of teachers' work that contributed to future careers.

Students described the role of the teachers in a similar way, whatever the form of their choice trajectory, with a difference in the timing of teacher-endorsed choice. Students with a 'directed' trajectory were most likely to have asked about subjects in relation to their career idea by the middle years of secondary school, and those with the 'multiple projection' trajectory were most likely to make an active approach to teachers to discuss a possible career idea towards the end. Students generally seemed to be resigned to the neutral position that teachers took in relation to post-16 choices, because they recognised a more important role of the teacher to be that of teaching subject matter.

### **6.3.2 School Subjects**

Students with a 'directed' trajectory saw school subjects in utilitarian terms, i.e. related to a career idea throughout the last three years of secondary school. They tended to respond to questions about the usefulness of subjects by personalising the response and relating them to their own perceived future subject requirements, as noted in chapter 5.

Thomas E was typical because in year 10 he was beginning to think about subjects that he may or may not need in the future.

I: Any subjects that you have rejected for after GCSE?

Thomas E: French and I don't think geography either. Maybe science, but I may need it for PE.

Hannah who thought about being a paramedic said in year 10:

Hannah: I've already decided that I won't do geography and history. I enjoy them, but I don't really want to follow them on. I don't think they will be useful for me.

The 15 people with a 'directed' trajectory were nevertheless convinced of the necessity for the three compulsory core subjects, whichever career they had in mind.

Claire, who decided to become a beauty therapist:

I: What subjects might be useful for a career?

Claire: Maths, science and English. Most jobs you need to have them.

Similarly, Thomas E agreed with core subjects.

I: Which subjects do you now think should be compulsory for GCSE?

Thomas E: I think English, maths and science should be compulsory.

Students with a 'partially resolved' trajectory, numbering 16, had similarities to students in the 'directed' group when they talked about subjects in terms of their usefulness and relevance to their particular future career direction. They also saw subjects as useful generally, even though there were some subjects that they personally had decided not to continue.

Asked about curriculum subjects in year 10:

Liz: English helps in everything. A lot of science is the basis for other things like technology and geography.

They concurred with the necessity of compulsory subjects in years 10 and 11. Of the core subjects there was complete agreement about the necessity for mathematics and English and most people in this group justified the place of science in the core curriculum.

Tom for example in year 11:

Tom: I think sciences are useful. They give a very broad sweep and come into most jobs.

When students were interviewed in year 10:

I: Which subjects do you now think should be compulsory?

Rachel D: All the English, maths and science I reckon.

I: Which subjects help you with other subjects?

Liz: English helps you with everything. A lot of science is the basis for other things like technology and geography.

All the students whose trajectory was 'partially resolved' indicated subjects that they did not wish to continue beyond the age of 16 because some subjects did not fit in with ideas for their future.

Rachel divided subjects into those that were useful generically and those that were useful specifically.

I: What subjects might be useful for a career?

Rachel D: To me personally. Maybe business studies. Oh generally? English generally and science.

Those students with the trajectory of the 'funnelling identifier' tended to have a view of curriculum subjects in terms of a group of related potential careers, with increased certainty over time.

In a year 9 post option interview:

I: Did you choose options with post-16 in mind?

Sarah R: I might want to carry on drama and maybe child development or French.

When asked in year 10:

I: What subjects might be useful for a career?

Kurt: Graphics because you can get a job with a lot of money.

Eddie: Some people might need design technology.

There were some subjects like sociology and psychology that were not offered at GCSE level in any of the six schools, but which were on offer at sixth-form level. Students with a 'funnelling identifier' were most likely to choose A-level subjects that were new to them. In year 11 Hayley expressed a common view,

Hayley: Psychology looks really interesting and it's new.

The 9 students with 'multiple projection' trajectories gave different responses about which subjects might be useful for a career at different times over the three years. Subject content tended to be judged against their own future needs and their views were personalised in utilitarian terms, depending on which career they were considering most strongly at the time.

Sarah J for example in year 9:

I: What have you considered doing after your GCSES?

Sarah J: Probably go somewhere and do either drama or art.

In year 10:

I: What have you learnt in science that might be useful for a career?

Sarah J: Nothing. Don't think so, no.

Sarah chose an Advanced GNVQ leisure and tourism course. James B showed a similar pattern. In the first interview:

James B: I find history and geography a bit boring. You seem to learn a lot and nothing has got any relevance.

In the second interview towards the end of year 9:

I: What subject would you not take if you had a free choice?

James B: I probably wouldn't do French, but it may be useful so I would stick with the ones that I have.

In year 10 James B's ideas were influenced by consideration of a career in psychology.

I: What have you considered doing after your GCSEs?

James B: I intend to go to sixth form. Psychology and possibly history. I might do psychology at university.

James B had wide interests.

I: Which are you enjoying best out of English, maths or science?

James B: Probably science. There is more in the subject that I like, more activity.

In year 11 James B talked about his resolution to become a barrister and chose A-level history, psychology and English literature.

Katherine, similarly to other students with the 'multiple projection' trajectory, appreciated the scope and generic usefulness of school subjects. During the final interview she remarked:

Katherine: I think science is about everything!

Katherine's ideas were slightly different to those of students with a 'multiple projection' trajectory. Although, typically, she matched her self image against several careers her responses about school subjects over the years were not career-specific.

Her typical response in year 10:

I: Which subjects might be useful for a future career?

Katherine: A career? Well most of them really, English, languages, maths, science.

The remaining 12 students who thought that they had been forced to choose subjects at 16 years old, and therefore had a 'precipitating' trajectory, made choices that aimed to keep options as open as possible for the future. They did not see subjects in terms of a specific career; indeed, throughout the study they were the most likely to

see curriculum subjects in generic terms. Students with a 'precipitating' trajectory did not work on the assumption that their choice of subject would lead to one specific career, and it was in this group that the idea of a working life that would involve several careers came to the fore during the year 11 interviews.

I: Where do you see yourself in ten years time?

Becky: I imagine I'll have several things like writing articles and lecturing or maybe a theatre critic, not one set job.

Martin: I hope to have an enjoyable job somewhere. I may have been replaced by a computer and looking for a new career.

The terms in which students saw school subjects seemed to be related to their type of choice trajectory; more generic for those students with a 'precipitating' type of trajectory, seemingly because they enjoyed a wider variety of subjects and saw them in broader terms in relation to future working life than other students. Moving across the groups of the typology, students with a 'multiple projection' type of trajectory had loosely considered a variety of subjects in connection with different career ideas, but chose post-16 routes for breadth. Students with a 'funnelling identifier' trajectory saw some subjects as more relevant than others in relation to the broad vocational direction that they had in view. The student with a 'partially resolved' trajectory favoured quite a narrow range of subjects linked to their vocational direction and students with a 'directed' trajectory selected from among those subjects that were directly relevant to the specific career that they had chosen.

### **6.3.3 Careers Education and Guidance**

Careers education and guidance includes careers education lessons within the school's personal and social education programme and access to a computer-assisted careers programme. Compulsory work experience of two weeks duration takes place at the end of year 10 or the beginning of year 11, and all students have access to a careers officer from the careers guidance service.

What students expected from careers education and guidance seemed to be similar, whatever their choice trajectory. This was evident in year 9 when students were asked what they would like to know about careers education.

Thomas E (directed): I think it would be very important to know what you are getting yourself into. That way you wouldn't go for a job and find out that it wasn't what you really wanted.

Chris (partially resolved): Whether that sort of job would suit you and whether you would enjoy it.

Charlotte (funnelling identifier): Different careers. The most important things about careers, qualifications and what's involved.

Michelle (multiple projection): I'd like to know about skills and the subjects you need. It should start in year 9 because sometimes in year 11 it's too late and you haven't picked a subject that you need.

Ellie (precipitating): We should be given some insight into a variety of careers, where the different subjects can lead you.

Students continued to have similar expectations about careers guidance throughout years 9,10 and 11.

James W: I'd like the addresses of colleges where I can go and study. I'd like to know what grades I'd need.

Many of the students had been encouraged by the general advice.

Richard: I think that my careers teacher has helped me to gain confidence and go and see people.

Although expectations were similar, there was a marked variation, according to the type of choice trajectory, in the way that students experienced careers education and guidance. Different interpretations of the role were made and different students worked on different assumptions, depending in which of the groups in the typology their trajectory was located.

Students in the 'directed' group assumed that the practices for guidance were based on a firm idea for a future career.

Kieran: You've got to know what sort of job you want to go into in year 9. At the end of year 9 you choose a career.

Each of the students in the 'directed' group approached careers education with the aim of reinforcing a well-established position.

Kate was determined to do art. This is what she said in year 11:

I: Tell me about careers education

Kate: My individual interview was quite helpful. I was given information on courses with art.

Like others with a 'directed' trajectory, Thomas E made the further assumption that having a specific career in mind was the best way to maximise the benefits of careers guidance.

Thomas E: The careers interview was helpful. I was given a load of leaflets on leisure and tourism. Your interest is where they start from.

Greg wanted to have a career with PE. He found that the computer assisted careers programme (CACP) outcomes were in keeping with his idea.

In year 10 Greg was asked:

I: What have you had in the way of careers education since I saw you at the end of year 9?

Greg: The CACP. Professional sports person I came out with. I like PE a lot. Some of the other things like pool attendant I don't think were very good.

People who were resolved about their future expected work experience to be relevant to their career idea.

Kevin: Work experience was very interesting. I would like my eventual job to be better, but it was a good introduction to electrical engineering.

William had plans to become an architect.

William: I imagined it would be a bigger place. I was looking forward to it. I worked in an architect's office. It was quite boring. I wanted to see what work was like, just out of interest.

I: What was it like?

William: Longer hours. More tired, but I wouldn't say more difficult.

In year 10 Jody thought that her work experience would be relevant.

Jody: I am going to work in fashion. I think it will be good because that's what I want to do.

In year 11 she related that things did not work out as expected.

Jody: I did work experience in Miss Selfridge. I was put off by the people and you don't just finish when the shop shuts. They only let you go when everything is perfect. I don't want to work in a shop.

Generally, those students with a 'directed' trajectory expressed satisfaction with procedures for guidance in school in connection with their established career idea, although work experience was often a disappointment. Some doubts were expressed about the way that their career idea was unquestioningly accepted as the basis of careers guidance.

Asked in year 11:

I: Would you have wanted any other help in choosing your A-levels?

Adele: Yes, I think I would. Because I have one idea it doesn't mean I should be left to get on with it.

Erica: There was no real discussion. They never made sure. I think they should. Well, they just assume you have got it right.



Greg did not seem to have used careers education and guidance in the same way as those with a similar 'directed' trajectory and was the most critical of what was available in school.

Greg: They don't really teach you about careers or jobs and they weren't very informative.

For the majority of students who had a 'partially resolved' trajectory careers guidance did not live up to expectations of the provision of detailed information about careers. The tone was often somewhat resentful in describing their experiences.

John S: It seems to go round and round the same thing. What do you like? Well if you are good at it -problem solved!

James W: The careers guidance people are poor. You went for this interview. You told her what you wanted. We filled out forms about what we are like and what we like, but she did not know us.

Abi: You chose a group in the sort of things that you had decided upon.

Within careers education the CACP was thought to give a satisfactory listing of possible jobs.

Rachel D: We did the CACP and the questions were weird. Some of the jobs that came out I wanted to do. Quite a lot of 'arty' jobs, architect, designer.

Mary: A few jobs that I got from CACP seemed quite interesting.

Reactions to work experience were mixed.

I: What was work experience like?

Tom K: I was really unsure, but it worked out very well. I liked what I was doing, quite a bit of work on computers and I also learnt about management structures.

Mary: I went to a bank for work experience. I did not do much. The people weren't very interesting. All in all quite boring.

When work experience took into account the interests of the students, it was considered to be worthwhile, but not otherwise.

Most of the students with a 'funnelling identifier' trajectory were going on to A-level and they felt that students who were less sure about the next step were a higher priority with respect to careers guidance.

Lorraine: For people like me definitely doing A-levels they had ten or twelve in a group for the careers officer. They told you about A-levels, but I had been to the sixth form open evening, so it was nothing new.

Careers teachers were seen to give general information.

Grace: We were warned that we should think that A-levels is for the next two years so we have to think about what we would still be happy doing at the end of two years.

In contrast to the students with a 'directed' trajectory, students with the 'funnelling identifier' trajectory had superficial expectations of work experience that amounted to a glimpse of the work environment.

I: What do you think is the purpose of work experience?

Michelle: It's to get a taste of work. First hand experience.

I: What do you think it is going to be like?

Michelle: I think it will be fun too. Learning new things and meeting new people.

They had felt the benefit of work experience, but probably not quite in the way intended. The commonest reaction was to aspire to something more interesting and to renew their efforts to do well at school.

Shelley: Work experience will make me work harder at school to get a better job.

Hayley D: Work experience taught me how monotonous a job can be. I have to have a job where I can use my brain and be an individual.

Andrea: I think that I would like to know more about the courses at university to think ahead and plan A-levels a bit better.

Although students with the 'funnelling identifier' trajectory seem to be comfortable with the perceived priorities of careers guidance, they felt that much of their time had been wasted in the delivery of information in large groups with a careers officer, or in spending what they considered to be an unreasonable amount of time filling in forms for sixth form applications.

The students with the trajectory of 'multiple projection' had pursued some of their ideas about a future career by active consultation with teachers and use of the careers database. James B described careers guidance as uninteresting because it was mainly about raising awareness of a student's strengths and abilities. He wanted information about routes to a range of careers and he thought that the database used for CACP was limited. In year 11 he commented.

James B: CACP suggested that I be a shepherd. I tried the library database and that came up with a shepherd too. Someone thinks I'm destined to be a shepherd. I looked up things to do with law. I'm pretty much decided to be a barrister.

The course of their 'multiple projection' trajectory was fused into a single pathway on the basis of having considered details about several courses and/or career options.

Joanne: I am really interested in biology so I chose that. I have got better at geography and it is a subject that cuts across other subjects. I spoke to my business mentor about IT. GNVQ was suggested, but I think it is a commitment to do one thing.

Work experience seemed to have generic value for people in this group.

Joanne: Work experience is just to see what work is like.

Michelle: It's to get a taste of work. First hand experience.

The majority of the students with a 'precipitating' trajectory had accessed the careers database at school and had looked up university courses. Of all the students, these made the most use of the careers library, presumably because they were trying to find out more about different careers and their requirements.

In answer to an enquiry about careers education in year 10:

Hester: We spent five weeks on the CACP. It was useful to go and look up different careers.

Reuben: Sometimes when I am in the library I get a book, look at the jobs, see what there is.

Many members of the 'multiple projection' group judged the value of work experience as a general introduction to the world of work in a similar way. Experiences matched expectations, for example, just before work experience (end of year 10):

I: What do you think it is going to be like?

Sam: The real world, not the pretend world of school.

Thomas W: It's to prepare you to get a Saturday job or something. To meet new people. To be able to work with different people.

Just after work experience:

I: What was work experience like?

Martin: They were really nice to me where I went. I thought it was worthwhile. I learnt to get on with people, sort of fit in.

Several members of this group, as well as some with a 'multiple projection' trajectory pointed to the limited nature of available careers information. They expressed a feeling of unease about their experience of choice and about the adequacy of advice offered.

I: Tell me about careers education

Becky: She told me at the careers interview that English literature would be a good subject with theatre studies so I thought I would do biology for variety. The careers officer said it was not a good idea to do biology. It is still between history and biology.

Several students with a 'precipitating' trajectory in a similar way to James B with a 'multiple projection' trajectory remarked on the limitations of the careers database.

I: Tell me about careers education

Martin: I thought CACP was a waste of time because it's stupid to ask computers to think about humans. The whole thing is limited by the size of the database.

Each of the students with a 'precipitating' trajectory made the underlying assumption that careers advice was directed towards those students who knew what they wanted to do in the future, the very assumption that was made by students in the 'directed' group, but with different consequences.

I: Would you have wanted more help in choosing your A-levels?

Ian: Yes I wanted a bit more than ... 'What are you interested in?' They should have more up-to-date information.

Becky: It was like 'if you want to do this job here is what you have to do.' It's a bit difficult if you don't know what you want to do.

The expectations of careers education and guidance were similar for each of the students during year 9, but the actual experience of this aspect of choice depended upon the students' choice trajectory and whether they had a firm idea about a career direction. Students with a 'precipitating' or 'multiple projection' choice trajectory indicated that by year 11 they were resigned to the idea that, for them, careers education would be deferred until sixth form. Work experience was not considered to be directly relevant to a future career, and many of the students whose choice trajectory was 'precipitating' or 'multiple projection' felt that, although they had been presented with some interesting ideas, careers databases were limited in scope.

Students with a 'directed' choice trajectory seemed best able to use the experiences of careers education and guidance productively, in comparison with those who had other choice trajectories, because they started off with some clear ideas about their future career direction. The computer assisted careers

programme (CACP), a searchable database of careers, which was used towards the end of year 10, tended to list the same or similar careers to the ones they had chosen, an endorsement of their ideas. Work experience was also often relevant to their future intentions.

The variable means by which students had arrived at their choices was affected by the ways in which careers education and guidance had been used in the latter half of secondary schooling. For the majority of students guidance routines were either confirmatory, i.e. they confirmed the career decision already made, or routines were aimed at encouraging students to choose subjects that they liked or in which they had accomplishment.

### **6.3.4 Family**

Each of the students assumed that parents would be involved in year 9 choices about GCSE options and most had discussed their choices with parents. At least one parent/carer of each student attended the GCSE options event that took place in each school with their son or daughter. In the lead-up to post-16 choices the students who wanted to take up apprenticeships took their parents with them, when they went to discuss their options with a careers officer or local company. Students who were going on to sixth form reported that their parents accompanied them to at least one of the sixth-form college open days in the area. Students generally used parents as a sounding board for their ideas throughout the last three years of compulsory education.

Parents were actively consulted to approve their son or daughter's ideas along a 'directed' trajectory.

Hannah: My parents were involved at every stage and they agree about the maths.

They called upon parents to assist them in finding out about appropriate choices to meet their goals at the time of option choices both in year 9 and year 11. The role of the parent was to support ideas and students were not sidetracked by parents' opinions about suitable subjects.

Kate in year 9:

I: What help did you get in choosing your options?

Kate: My parents were there to help.

In year 11 Kate's father made a suggestion which was not related to her future plans.

Kate: I love art so that has been a definite for years. My dad thought I should do maths because I don't find it that difficult, but when I saw the A-level syllabus, I thought it was unrealistic.

The students with a 'partially resolved' trajectory, with one exception, also started discussions with their parents on the basis of some degree of resolution and used their parents for reassurance rather than advice.

Grace, with a 'funnelling identifier' trajectory, was typical in looking to her parents for discussion within a domain of interest that she herself had established, although people with this trajectory were a bit more open to suggestions than either the 'directed' or 'partially resolved' groups of students.

Grace: The report had a box on it for teachers to recommend a student for A-level if they thought they could cope. There wasn't any discussion about it.

The students with a 'multiple projection' trajectory were similar to the students in the 'precipitating' group in the way that they discussed issues about choice with their families. Generally students in the other three groups looked only for confirmation of ideas, although Abi with a 'partially resolved' trajectory went against the general trend in one aspect by taking specific advice about what constituted an 'acceptable' subject in her parents' eyes.

Abi: I talked about it to my parents. They wouldn't be happy with me doing performing arts. They said media studies was all right. I wanted to do more things that were English-based.

The 'multiple projection' trajectory was also consolidated with advice and reassurance. In addition, family members sometimes transmitted the notion, accepted by the students, that some subjects have a stronger currency than others.

I: Tell me how you chose your A-levels.

Martin: My family have science-based jobs so they were pleased that I have science in with my A-levels.

Like most students who were interviewed, those with a 'precipitating' trajectory discussed post-16 decisions with their parents. The role of the parents tended to be in discussion, reassurance and in this group, more frequently than in the 'multiple projection' group, commonly advising on specific subjects that they perceived to have higher academic currency than others. Parents were involved in the fine-tuning of their children's decisions.

I: Tell me how you chose your A-levels.

Sam: I think I wanted to do something like business studies, but my dad did not really approve and he thought that economics would be a much stronger choice.

Sam decided on economics. Simon was persuaded by his parents to study physics rather than theatre technology; Hester to study geography; Ian to take physics.

Simon: I wanted to do something with more maths. I was interested in theatre technology, but my dad thinks it's more of a fluffy subject like performing arts and media studies. I think that physics will be good if I want to do theatre technology later and I have chosen economics as well.

Hester: My parents were keen for me to do geography because they both did geography and it's a very versatile subject.

Ian: Well the only real advice I got was from my dad, who suggested physics because it's going to be useful in a lot of jobs and it will be the basis of a lot of new jobs.

Students reported that their parents played a supportive role throughout the three years prior to post-16 choices. Parents and sometimes older siblings were usually the key people that students consulted about their choices. The parent of a student with a 'directed' or a 'partially resolved' trajectory was usually seen to have a good understanding of the career aspirations or interests of their offspring and parents played a validating role. A student who was less resolved allowed parents a more consultative role, and a student with a 'precipitating' trajectory was most likely to take specific advice from a family member when considering the final details of their ultimate choices.

### **6.3.5 Other factors**

There was a particular feature in the landscape of choice which was uniformly shunned by all students and that was the possibility of consultation with friends. A consensus of opinion was present in students' remarks that

discussing choices with friends could only lead to an unhelpful peer influence on choice, and students eschewed serious discussion about choices with their peers.

Ellie: We gossiped quite a lot. The teachers warned us not to do something your friends did.

Daniel F: Friends did not really influence anything

Sarah: We talked about it, but there was no point in doing what your friend does without wanting to do it yourself.

The students themselves saw this as a sensible idea and did not question the wisdom of never taking notice of friends.

Debbie: All my friends had a mature attitude. I am in textiles on my own, I did not find out what my friends were doing and say 'lets do textiles together'.

In all the schools the students had taken part in personal and social education that had involved expressing an opinion about their friends' qualities. Nevertheless, the activity did not build into fully-fledged consultation with friends.

The sixth-form interview played a critical part in the ultimate focusing of choices of 7 out of the 13 people with the 'precipitating' trajectory which was diffuse until the point of choosing.

I: Tell me how you chose your A-levels

Sam: It was incredibly difficult. I had a short list of about eight subjects because I like lots of subjects.

Becky expressed a wish common to many students with a 'precipitating' trajectory for help tailored to her needs.

Becky: Everybody thought that *his or her* subject was a good one for me to choose. I wish there was someone from school who would sit me down and go through it all.

Several students spoke about the value of the sixth-form interview in helping to 'precipitate' choice. Some students changed the subjects for which they had originally applied on the basis of advice from sixth-form tutors. The opinion of the interviewer was often taken as authentic.



I: Tell me how you chose your A-levels.

Ian: They knew more about what you can do with different A-levels at the sixth-form centre. We talked about electronics and then I realised that maths and physics was better because it did not close things off. Biology did not make it and I thought the geology was too specialised.

Hester: The college dissuades you from doing AS levels. They told me it was much more work than half an A-level.

The reputation of the sixth-form interview as a forum for resolution had spread to those who hadn't yet been interviewed.

Becky: I think I can talk to the teachers at the sixth form interview and make some things clearer. My friend had a very good interview at sixth form.

Advice at the sixth-form colleges seemed to meet the need for personal and specific advice expressed by many students with a 'precipitating' trajectory.

## **6.4 Roots And Routes**

The heterogeneity of students' ideas over three years and the factors in the landscape of choice that affected the formation of post-16 choices have been explored by considering the routes and roots by which choices came to be made in a sample of high-achieving students. The pertinence of the influence of a variety of factors and the ways that influences were used characterised each students' trajectory of choice. The types of trajectory were established as a typology of choice trajectories. Some of the characteristics of the choice trajectories are presented in Table 4 to show how the five trajectories are distinguished from each other.

It has been established in the preceding and in the present chapter that secondary school students' ideas change in different ways, which have been modelled as a typology of five trajectory types, each characterised by the way that the trajectory was moulded over three years. The ideas of a student with a 'directed' trajectory type were convergent and based on continuous certainty about their future, whereas the ideas of a student with a trajectory type of a more open type such as the 'precipitating' trajectory were divergent and based on uncertainty about a future educational direction as post-16 choices were approached.

**Table 4 A Comparison of the Choice Trajectories**

<b>Choice Trajectory</b>	<b>Characteristics of Choice Trajectories</b>			
	<b>Post-16 Objectives</b>	<b>Critical Influences</b>	<b>Careers Education/ Guidance</b>	<b>Perception of School Subjects</b>
<b>Directed</b>	Stable and strongly vocational	Inspirational catalyst identified	Confirmed and informed career ideas	Related to career idea
<b>Partially resolved</b>	Stable vocational leanings	Influences absorbed into ideas	Confirmed vocational area	Related to vocational area
<b>Funnelling identifier</b>	Gradual focus towards a domain of interest	Subject liking or visible career	Confirmed decision for advanced study	Grouped into subject areas
<b>Multiple projection</b>	Varied and changing vocational projections	Students researches a variety of careers	Informed about a range of careers	Generic
<b>Precipitating</b>	Diffuse ideas	None identified	Accepted as deferred	Generic

For the purposes of analyses of interview data over three years, it was accepted that the choice by 16-year-olds of post-16 education is influenced by various factors, particularly attitudes to subjects. The operation of the influence of teachers, parents and careers guidance characterised each trajectory type and showed significant variation in the dynamics of choice in the five trajectory types. The input of the teacher was more actively sought and considered more useful for the student with a 'directed' trajectory than for the other students with other trajectories and was dependent on the way in which students' ideas about their future beyond school have been focused and justified. Milner *et al.* (1987) hypothesised that students do not perceive the influence of teachers on their choices in relation to science, and it was possible to conclude that this was the case with the majority of students in the present study across science and non-science subjects alike.

Parents were seen to accompany their children along the choice pathway in different ways and to serve different purposes, depending on the choice trajectory. For students with a 'directed' type, parents followed their children's ideas and helped them to identify subjects for further study that were appropriate to a fixed career idea. When students had a 'funnelling identifier' or 'partial resolution' type of trajectory and career ideas were partially focused parents seemed to play a supportive role. When students with the 'multiple projection' or 'precipitating' trajectory seemed to be open to a wide range of possibilities, parents often made suggestions, based on the notion of stronger and weaker subjects, to help strengthen their children's profile for university applications.

Careers education facilities and advice were available in all six schools in the study, but the way in which careers education and guidance was used varied across the groups and depended on the students' starting points or assumptions and, therefore, the stability of their ideas over time. Students with a 'directed' trajectory thought that they made the most effective use of the facilities because, three years before choices were to be made, they started with a clear idea about a future career. Students with a 'partially resolved' trajectory were able to ask about careers within a

narrow domain, whereas students with a ‘funnelling identifier’ trajectory had ideas that were too wide for vocationally orientated career advice

Students with a ‘precipitating’ or ‘multiple projection’ trajectory felt that the guidance and advice on offer could have been painted as a broader canvas of career possibilities to match their open-mindedness.

Similarities in the way that influences operated in different choice trajectories were found in three main areas. Most students articulated expectations and needs for advice about careers, particularly a hope that a wide range of options would be discussed. Students were very committed to the inadvisability of discussing option choices with their friends at the year 9 or the post-16 option stages for fear of taking a subject simply to be in the same group as their friend. In common across the trajectories was the view that teachers were not, and not generally expected to be, proactive in advising about choice, but were considered to be approachable for advice and endorsement. Subjects were sometimes chosen because a particular teacher had been inspirational, but only three teachers among the six schools were mentioned in this context.

The typology of choice trajectories that has been developed shows that there is variety in the routes by which students arrive at post-16 decisions and in the roots of those choices. The routes that students took have been grouped into a typology of trajectories of choice depending on the *ends* for which choice is made. A well-defined career aim structured the ‘directed’ choice trajectory, the aim becoming less pronounced for the ‘partially resolved’ and even less so for the ‘funnelling identifier’ trajectories. The indistinct aims of a variety of career possibilities visualised by students with a ‘multiple projection’ trajectory and a variety of broad educational aims for students with a ‘precipitating’ trajectory gave choice trajectories that would result in broadly-based choices. The roots of choice for each choice trajectory have been described by exploring the *means* by which students’ ideas change; first of all, in terms of the pertinence of guiding influences on choice trajectories throughout the last three years of secondary schooling; secondly, in terms of the variety of different ways that influences have been considered and utilised in different types of choice trajectories.

The typology of choice trajectories that has been developed in this chapter, by reference to the landscape of choice, will be applied in the next chapter to a selection of 16 year olds, who have made choices in favour of science, with the aim of discovering how the trajectories operated in choices with respect to science.

## Chapter 7 Findings: Routes To Science

I have responded to the first research question about the way in which students' ideas changed as they approached post-16 choices by theorising a typology of choice trajectories, which emerged in chapter 5 and was developed in chapter 6. In this chapter the second main research question about the way in which changes in students' ideas affected their choices with respect to science is addressed. The longitudinal choice trajectory of individual students' ideas is related to the option of studying post-compulsory science among this selected sample of higher-achieving students who were potentially capable of studying science further. The ways in which changes in students' ideas lead to choices about science are identified for individual students by reference to the code cluster, 'ideas about science', that was defined and explained during analysis (see Table 3, chapter 4).

I narrowed down the focus from student post-16 choice in general to the particular case of choice about sciences. The longitudinal data collected for the present work was analysed to examine the ways that students thought about post-16 science as they matched up their ideas to their expectations. The analysis was grounded in the data and did not depend on assumptions or other research about the way that young people choose science.

I challenge the commonly held image of the type of person who decides to study science as 'identity resolved' from an early age by demonstrating that people with different choice trajectories make the decision to study science. As discussed in chapter 3, decision-making for a future career is considered to be the matching of perceptions of careers against a person's self-image to assess compatibility. Using evidence about the way that scientists are seen, Head (1997) contends that the typical way to choose science is in a 'foreclosed' manner, according to Marcia's (1980) categorisation of identity statuses, and that the decision to opt for science shows someone who is

Essentially avoiding anything that would force them to abandon a false maturity and security of foreclosure.

Head (1997), p.79

To substantiate his claim about the nature of young people who take up sciences, Head uses evidence about the emotional and personality characteristics of adult male scientists. On the basis of this evidence Head reasonably concluded that mature scientists are perceived to display certain characteristics, but the evidence says little about the ideas of the student at the time that they are opting for science and nothing about the ideas that precede the point of choosing. The use of Marcia's categorisation, which has been re-evaluated in the light of more flexible models, (as discussed in chapter 3) was inappropriate as a model of career identity formation in the mid-1990s, when the present work took place.

Gender issues have been explored in relation to science in school and science careers including gender differences in attitudes to school science (Jones, Howe and Rua, 2000) and occupational aspirations (Furlong and Biggart, 1999) and a lack of role models for girls (Solomon, 1997). The assumption that there is a lack of variety in the dimensions of choice among those who become scientists, with males overwhelmingly dominant (Ainley, 1993) was made at a time when females exceeded males at medical school and two fifths (40%) of the scientists employed by the Medical Research Council in the UK were women (Blake, 2000). Boys who choose science are seen to be more interested in the subject whereas girls who choose science are commonly seen to have a strong vocational projection towards a science-based occupation. This gendered assertion was examined.

## **7.1 Four Students Who Chose Science**

To begin to clarify some of the issues involved for people who choose science I separated out from my sample the 21 students who had chosen to study science further. These are presented in table 5 with a breakdown of choice trajectories, subjects to be studied post-16 and GCSE science grades achieved.

**TABLE 5 Post-16 Science Choices**

Group	% Science Choosers in Group	Name	Ref	Post-16 Choices. Course Choice or A-level Subjects			* GCSE Science Grades
Directed	4/15 = 27%	Kieran	SBB4	Geology	Class Civ	History	BB
Directed		Erica	NHG3	Maths	Sports science	Social Biology	AA
Directed		Greg	SBB3	Sports Science Advanced GNVQ			CC
Directed		Hannah	SWG3	Biology	Chemistry	Maths	A*A*
Part Res	6/16 = 38%	John S.	PSB6	Maths	Physics	Computer Studies	CBA
Part Res		James W	COB4	Aerospace Engineering Apprenticeship			CC
Part Res		Tom K	PSB3	Maths	Physics	Computer Studies	AAA
Part Res		Will	PSB1	Maths	Further Maths	Biology	Chemistry
Part Res		Mary	SBG1	Maths	Physics	Philosophy	AA
Part Res		Kester	SWB2	Maths	Physics	Further Maths	Computer Studies
Part Res							AAA

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\* #2 grades – double science GCSE  
3 grades – biology, chemistry, physics



TABLE 5 (Cont)

Group	% Science Choosers in Group	Name	Ref	Post-16 Choices. Course Choice or A-level Subjects				# GCSE Science Grades
Funn Ident	2/16 = 13%	Joseph	SWB1	Maths	Physics	Chemistry		AA
Funn Ident		Laura	NHG4	Psychology	Social Biology	English Language and Literature		CC
Multiple Proj	1/9 =	Joanne	COG3	Geography	Biology	IT		CC
	11%							
Precipitating	8/13 = 62%	Ian	PSB4	Maths	Physics	Further Maths	Chemistry	AA
Precipitating		Reuben	SBB5	Maths	Physics	Further Maths	Psychology	AA
Precipitating		Daniel H	BOB5	Electronics	Physics	Music Technology		AA
Precipitating		Simon	BOB6	Further Maths	Physics	Economics		AA
Precipitating		Richard	BOB1	Maths	Physics	Theatre Studies		AA
Precipitating		Becky	COG2	Biology	English Literature	Theatre Studies		A*A*
Precipitating		Ben F	NHB2	Maths	Physics	Economics		ABA
Precipitating		Hester	PSG1	Geology	Geography	Biology		ABB

The table shows that the choice trajectories of students who chose science were represented in each choice trajectory type. The data were analysed for all the students who chose science by relating each code cluster (see table 3, chapter 4) to the way in which science was chosen. Codes in the *<ideas about science>* cluster were related to codes pertaining to *<the dynamics of choice>*, *<ideas about school subjects>*, *<influential people>* and *<choices and how described>*. The choice trajectories of those who chose science were predominantly of three types: 'directed', 'partially resolved' and 'precipitating'.

I have selected one student from each group with the commonest types of trajectory of science choosers because the interaction of factors that moulded a choice for science was typical of that trajectory. One of the two students with a 'funnelling identifier' trajectory who chose science was selected because the data for this person touched upon important issues, noted in chapter 6, with respect to gender and to careers guidance. With respect to the one person with a 'multiple projection' trajectory, who chose science in a mixed A-level combination, an illustrative portrait could not be assembled, due to the limitations of the data which could support choice trajectory typing but could not typify science choices for the 'multiple choice' trajectory.

Portrait sketches of the four selected students who chose science post-16 are presented to show the typology of choice trajectories in action with particular reference to science.

### **7.1.1 ERICA**

Like all students with a 'directed' trajectory Erica had chosen a career by the time she was first interviewed early on in year 9.

Erica: I want to be a PE teacher. I really like PE, also I like children and even in year 6 in my old school, I used to help with reception class children. I like to be outdoors too.

At each interview stage Erica answered questions about career ideas in the same way. She had made up her mind to be a PE teacher. Over three years she consistently described herself as a 'sporty' person and her response to questions about after-school activities always included a variety of sports. Erica was

interested in several school subjects, but her special interests were PE, biology, creative writing and RE. She also enjoyed history in year 9 and would like to have taken history instead of technology (she chose textiles). She was particularly interested in biology and showed a substantial understanding of the importance of biology in the study of PE, although she demonstrated an antipathy towards chemistry and physics. In year 10:

Erica: I like biology, but not the rest of science. I enjoy maths so I am better at it.

When asked about the usefulness of subjects for home life or a career she responded from a personal perspective.

I: In your lessons do teachers explain how the work can be applied to everyday life?

Erica: Sometimes. In physics they talk about boiling kettles and heat transfer, but you don't really need to know that to boil a kettle.

Her idea of a scientist in year 9 was of an extremely 'brainy' person who had to know a lot, be patient and organised. This vague image had not changed nearly two years later when she responded to a similar question about her image of scientists.

Erica: I don't know. A scientific mind. You have to have patience. Accurate.

When asked about scientific news at the end of year 10

I: What news have you heard that has been connected with science?

Erica: I have heard about a protest against using animals in research. I don't think that animals should be treated badly, but if it helps people to get better, then yes.

Erica demonstrated an awareness of social issues surrounding science, rather than the practice of science or the variety of careers in science. By the end of year 10 Erica had decided against taking English, geography or physics after GCSE. She was self-deprecating about her abilities in science.

I: What have you considered doing after your GCSE?

Erica: At the moment I am thinking of doing biology, RE and sports science. I am not sure if my science is strong enough.

In year 11 some basis for her opinion was explained and she indicated that she did not see herself as a 'science person'.

Erica: I really don't think I would be good enough to do anything with science. I did not take the three sciences. I think most of the science people will come from the three sciences group.

Erica found the chemistry parts of science SATs taken in year 9 to be the hardest part of the SATs test, although she found that her understanding of mathematics helped her with physics. Interestingly there seemed to be no influences on her choice trajectory that made her consider studying physics further. She did not take the three sciences option for GCSE offered at her school and she was of the opinion that the three sciences option was for people who intended to go into a science career. Despite reservations about her own ability to do physics and chemistry, Erica continued to support science in year 11 as a core subject.

Erica: I think most things involve science. It should be a core subject. Yes.

Erica showed a limited appreciation of areas of work that involved science. She was unable to match her perceptions of a scientist as a very 'brainy' person needing patience to do accurate work against her future self. Erica underestimated her potential in GCSE science despite achieving a double A in sciences and an A for mathematics. She also thought she had little aptitude for a science career, because of a somewhat narrow understanding about science careers. Erica seemed to have limited knowledge of the range of potential science-related careers in areas other than PE and physiotherapy. She thought that science was presented in a boring way in school and would have liked to be given more of an idea of the range of science occupations.

Erica: There were posters in school that gave you an idea what it was like in a real science job. I like the ones about real people, 'Susan, 23 years old is a radiographer'.

Her parents accepted the basis upon which she made her post-16 decisions, but dissuaded Erica from studying RE at A-level, her original intention, and instead she chose mathematics as a '*solid subject*'. Erica's parents' advice was that '*she couldn't go wrong with mathematics*'. Erica decided upon social biology (because it looked less scientific than biology), sports science and mathematics at A-level, seeing this as more of sports-related than a scientific direction to take. The A-level combination that Erica chose, with its high science content, could be regarded as a group of science A-levels, but Erica regarded it as a mixed A-level choice.

Erica's trajectory conformed to criteria for the 'directed' group in that her determination to be a PE teacher directed her ideas throughout years 9, 10 and 11 when she was considering her future.

### **7.1.2 WILL**

Will's trajectory was 'partially resolved' in the sense that he made his interest in biology abundantly clear at all stages of the study and, by the end of year 10 he had taken the decision to do mathematics at A-level. He also spoke about doing English A-level, but eventually decided upon biology, chemistry, mathematics and further mathematics.

Right from the first interview Will gave the impression that he had wide interests and enjoyed a variety of school subjects.

I: What subjects do you like?

Will: I like maths because we are always doing something new. IT too. I just like the possibilities of IT. In DT (design technology) we haven't done much, but it is interesting.

English is always interesting. I think it's the variety of things that we do. I like it most when we discuss things that are controversial.

I: Are there any subjects you particularly dislike?

Will: No. I find interest in most things.

Outside of school Will participated in IT and sport recreationally.

Will: I like activities that are fun. I'm not madly competitive.

In year 10 he continued with school clubs in IT and sport and also started to attend art club that year. For one of his year 9 option choices Will chose the three sciences option, rather than the compulsory core subject of double science. He also wanted to continue with expressive arts.

I: Were there any subjects that you would have liked to continue, but you couldn't fit into your option choices?

Will: I would have liked to continue with expressive arts, but I chose media studies instead, because I think it is more important. I can do art at home so I don't mind.

Will seemed to be receptive to a variety of career possibilities, although he did not see himself as a linguist.

At the post-option stage:

I: Have you decided against taking any of your school subjects after you leave school?

Will: Not really, no. I might not be doing French, but if I have any contact with France then it will be important.

In year 10:

I: Do you see any subjects as not useful for home or working life?

Will: I don't think French will be useful for me for a career, but perhaps if I go to France.

The only antipathy he expressed was towards the technology choices.

Will: I can't see why you have to choose a technology out of textiles, food, graphics and construction.

Will constructed images of scientific work based around his interest in biology, although he had a generic picture of the scientist.

Will: People who have an interest in being able to explain things and who like to go deeply into how things work. I do see them as curious.

His response to imagination probes about what he would do if faced with a compulsory order to do a job connected with science revealed his leanings. In year 9 he said:

Will: Something in medicine. Cancer research or a disease.

In year 10 he was proactive in exploring careers in alternative medicine, including aromatherapy and reflexology, and when asked again what science career he would choose he said:

Will: Something in medicine, maybe a doctor or medical analysis, blood or .....

At the end of year 10 Will said he preferred English out of the core subjects, even though he eventually chose sciences and mathematics.

I: Which are you enjoying best out of English, maths and science?

Will: It's English. There are so many interesting things that we do in English. Science is all right, but I actually enjoy the English more. Maths is not that interesting sometimes, but I can just do it.

In addition to commenting that less practical work was done in year 11, Will criticized the quality of practical experiences in science.

I: What is science like in school?

Will: I don't enjoy it very much here. Not all teachers can hold our attention. The practical is pedantic. We know that to get high marks you have to put in a lot of detail, but we are not experimenting anywhere near the level of the write-up.

Will demonstrated an awareness of the breadth of science work.

I: What would you do to get more people interested in science?

Will: I think that they should extend the things that are seen as science. Science comes into a variety of work and you want to give yourself a better chance of doing good work in a lot of jobs by doing well.

He expressed caution about committing himself to a specific career when presented with a list of possible science-based careers.

I: Have a look through these jobs. Can you see yourself doing any of them?

Will: They are quite narrow sort of careers, so I haven't heard about them specifically. I can't know that I might specialise in photography or veterinary medicine when I am older.

When it came to the final selection of subjects for A-level Will, unlike most of the people interviewed, was shown the UCAS book of courses as a basis for his choices.

Will: I might want to become a doctor. I discussed doing maths and further maths at home. I'm not keen on a career as a mathematician, but I am doing it to improve my career prospects. A versatile subject as the careers officer said. The message seems to be to keep an open mind about a variety of careers and to do A-levels that are versatile.

Will had carefully considered a range of options and chose subjects on the basis of their versatility in relation to courses in higher education. He presented as an active and genuinely mature participant in a wide range of subjects in and out of school and seemed to be proactive and analytical in making his post-16 choices.

### **7.1.3 LAURA**

Laura had a choice trajectory which in its formation had most in common with the 'funnelling identifier' group. In years 9 and 10 the trajectory had some elements in common with the 'partially resolved', with a progressive focusing of ideas towards a science career. Laura's trajectory was grouped with the 'funnelling identifier', because at the end of year 10 she was deterred from a career in forensic science resulting in a reconsideration of options on a broad basis and then to a 'funnelling' of her ideas which lead directly to her post-16 choices. When asked at the beginning of year 9 about her ideas about what she might do after school Laura gave a definite answer.

Laura: Some sort of scientist.

When asked what subjects she liked, she explained:

Laura: Science and I especially like chemistry. English, geography. Maths is all right and PE as long as I like the block they are doing.

With respect to PE she mentioned that she was a county runner, and she also showed an interest in biology.

I: What would encourage you to go to a science activity?

Laura: Something a bit different would be good. I wouldn't mind doing a dissection.

Towards the end of the second term of year 10 Laura still had a positive attitude to science and was looking at choice from the point of view of a career in science. Laura was unhesitant in citing forensic science when asked to imagine what career she might choose in science. She was disappointed by careers education.

I: What have you had in the way of careers education since January?

Laura: We had an introduction to the careers library. The jobs I want to do are to do with science and they did not really have much on that. There was a bit on physics and chemistry, but not a lot on what you can do with biology.

This seems to have been one of the pieces in a jigsaw of discouragement with regard to a career in science. Also in year 10:

I: Do your teachers explain about careers connected to the work you do in class?

Laura: It's all been shelved. "You're doing my subject now. You have to get your GCSE grade."

After her year 10 careers interview Laura gave up on the idea of forensic science. In year 11 she reported:

Laura: In my careers interview I mentioned that I had always wanted to be a forensic scientist. The careers officer told me that I needed two A's at A-level in sciences and I needed maths grade A or I could become a doctor first and then a forensic scientist. She suggested a health and social care course when I said I was interested in medicine.

I: Would you have wanted any other help in choosing your A-levels?

Laura: Well, I saw this job on television about photographic forensic science. I would like to know more about that.

Laura identified psychology, social biology and English (language with literature) for A-level studies by a gradual process involving much deliberation and hesitation throughout year 11. English was Laura's highest predicted GCSE grade, which, she said, gave her confidence to study it further and she chose social biology because of its relevance to everyday life. Laura's choice of



psychology was part of a trend prevalent among students with a 'funnelling identifier' trajectory to choose subjects that seemed interestingly new. Laura's parents were typical in the way that they supported choice formation along the 'funnelling identifier' trajectory encouraging Laura to undertake further study of subjects in which she was interested.

When shown a variety of jobs in science during the year 11 interviews, Laura asked about forensic measurement (a career accessible through advanced GNVQ science or via a day release technician course) and she remarked,

Laura: I did not know I could do that. I think that the careers teachers should know a lot more. I was told I needed high A-levels to do forensic science. Well, I don't think I'll change my A-levels now.

On the basis of evidence collected in years 9 and 10 Laura painted a picture of herself as a person who favoured a career in science, but who changed her mind in year 11. Her knowledge of science careers was limited to forensic science and she had hoped to obtain more information from school. She was not herself proactive in finding out about different entry levels to or different types of science careers. She seemed to realise too late, during an exchange in the last interview of my research, that there exist in science careers which require less than three A's at A-level, but she said she was contented that the A-levels that she had chosen could lead to something interesting.

#### **7.1.4. RICHARD**

Richard was representative of the people with a 'precipitating' trajectory who chose science. From the first interview he portrayed himself as somebody with wide interests, who liked to be active and who was creative.

I: Imagine that you had to choose a career in science. What would you choose?

Richard: I would do some fieldwork instead of lab work. Is that what you mean? I like things that are unexpected rather than you know what you are doing in a lab.

I: What do you think of English as a subject?

Richard: Poetry is the only thing I like writing. I don't know why, it's more descriptive somehow. I do like the role-plays that we do.

At the end of year 9 he said he enjoyed mathematics.

Richard: We do a lot of problem solving in maths and that is a challenge and I enjoy that.

As he said in the year 10 interview, his interest in drama continued:

I: Which ones are you enjoying the most?

Richard: I am enjoying maths and drama especially. I am enjoying most subjects really, struggling a bit with German.

I: What's on offer in the way of extra-curricular activities. What do you do?

Richard: Drama and the school production. I do a bit of football now and again.

Richard did not take the GCSE three sciences option offered by his school, but said that he had thought about it briefly. He was most negative about biology as a separate option subject, because he found it to be a 'hefty subject' with a lot of subject matter involved. He thought that separate sciences would have involved him in learning that was more factual.

Richard's open-mindedness with respect to a variety of future potential directions was characteristic of students with a 'precipitating' trajectory. Longitudinal tracking between years 9 and 11 showed that Richard had broad images of science work. He gave different answers in year 9 and year 10 to the same probe about what he imagined he would do if forced to choose a job connected with science, although no career was specified. In year 9 he said he would prefer to be working in the field rather than in a laboratory and in year 10:

Richard: I'd probably do something with physics. I don't know what.

Richard was allocated work experience in a solicitor's office and commented:

Richard: It will be interesting to see the law in action. A look at a career possibility.

In year 11, however, he explained that he had requested and had been granted a change in work experience to something more active.

Richard: I spent a week in an archaeological unit digging on site and then cleaning and restoring indoors. There was a lot of paperwork as well as being so active.

Like all the people who chose science in the group with a 'precipitating' trajectory, Richard did not stereotype scientists. Images of scientists probed in years 9 and 10 brought the following responses respectively:

Richard: They would have to know a lot and be very open-minded. It depends on what they do, if it was lab work on diseases they would have to know about geography. Someone willing to try lots of things.

Richard: They need to be brainy to understand the science. Hard working. Good at thinking for yourself.

In the year 11 interview Richard responded positively when shown a list of science jobs.

Richard: They seem to be the sorts of jobs that make the world go round. I would be interested if I weren't so keen on doing something technical in the media.

He seems to have had good experiences of science at school. During the first interview he was asked to describe science teachers.

Richard: The science teachers listen to you more. An English teacher would look at your work and think, "He hasn't done well at that piece of work", but a science teacher would come to you and ask what your idea was, because there are different ways to work it out.

At the end of year 9 when asked what subjects he liked:

Richard: Practical subjects like science and drama.

In the same interview he seemed pleased with science as a subject in which you had to work things out for yourself.

I: Do you enjoy any of the science activities?

Richard: We used computers for the planets and printouts. We did the research and we made maps of the stars. That was good.

In year 11 he said he preferred physics because there was a lot more 'hands on' work.

Richard: We do less practical in chemistry and biology and the equipment doesn't work. I don't really like labelling drawings and things like that.

When asked what he would do to get more people interested in science, Richard said that he would make it more interesting to people his age. As an example, he said that most people he knew enjoyed genetics, even if they didn't specially like biology.

Richard originally applied to sixth form to study mathematics, physics and computing, but like some other students with a 'precipitating' trajectory; he was given advice at the sixth form interview that helped to change his mind.

Richard: I started with a choice for computing, but when I went for interview at sixth-form college, it was less appealing than I thought. They suggested theatre studies and when I looked through the syllabus I found it had a good mix of technical theatre with other parts of theatre. Flea circuses mixed up with sciences!

In the portrait sketch Richard paints a picture of himself as a person who has made a genuinely considered and broad-based decision in a mature way with

the resources available to him. He was persuaded by the suggestion put forward at the sixth-form interview to choose what was a more appropriate combination of subjects for his interests. He had expressed his liking for drama throughout the last three years of secondary schooling and his eventual A-level choices demonstrated an awareness of the breadth of possibilities in future careers.

## **7.2 Science And The Landscape Of Choice**

Portrait sketches of students' ideas have demonstrated that four students who chose science arrived at their choices not by one, but by a variety of routes as exemplified by different choice trajectories. The ways in which students selected and used influences and information from the landscape of choice gave a complex picture of the underlying roots of their choices. There were differences in the way that students' ideas changed along different trajectories and, therefore, differences in the ways that students elected to study science. In the next section, the four portrait sketches will be used as a basis for demonstrating how the typology worked for the wider group of students who chose science post-16.

Table 5 shows the distribution among the five choice trajectories of the trajectories of 21 students who have included an element of science in their post-16 science choices. In answer to questions about how and why science was chosen it will be shown that the 'how' was determined by the ways that human and material resources were used to shape different choice trajectories across time and the 'why' is answered in a variety of ways, which go beyond perceptions of school science or occupational images of working scientists.

### **7.2.1 Science and the Choice Trajectory**

Like Erica, four other people taking some post-16 science courses had a 'directed' trajectory, characterised by career orientated ideas which were stable over three years and which led directly to their choices. Two of the five were intent on a career in sports science, one was resolved on medicine and one wanted to be a marine archaeological geophysicist. Two people wanted to be engineers. Only the latter three students who have been mentioned had chosen occupations that might be described as *'more ideas centred than people*

*centred*', which is characteristic of people who choose science for higher education (Woolnough, 1994). Even in the case of people who become geophysicists or engineers we have to be careful with definitions of the nature of scientific work. (Coles, 1998) provides evidence that a wide range of scientific work necessarily includes dealing with people, particularly in teamwork and in management.

The trajectory of post-16 decision-making in favour of science rarely resembled the 'foreclosed' manner in the sense that Marcia (1980) implied when he spoke about the person who chooses science as an individual committed to goals, which were largely chosen by others. Students with a 'directed' trajectory most closely resembled (albeit faintly) the 'foreclosed' type as described in chapter 3, section 3.1.2. Unlike the classic description of 'foreclosed' type they recognised an obvious influence that had fired their imagination, rather than any manipulation by parents or other significant adults. There was only one case (Jonathan) among the present 69 students who participated in the whole study, where the decision seemed to be based on a parent's idea rather than the students' idea. Typically for students with a 'directed' trajectory, parents and teachers were more usually called upon as a follow-up to validate and approve students' choices and not to lead them.

Among the non-science choices of students with a 'directed' trajectory, career aims included careers in sports (taking PE rather than sports science, which is not regarded as a science), beauty therapy, art, catering, law and architecture. The way in which the student with a 'directed' trajectory chose science was very similar to every other person whose choice trajectory was formed by the vocational direction that they had in mind from the beginning of year 9 or earlier. The occupations that students visualised can all be considered to be high-visibility occupations. The reaction to a list of science-related careers (see appendix A, year 11 interview), such as food science, pollution control and speech therapy, demonstrated an ignorance of the variety of science work. Students often showed an interest in some of the careers on the list. Whether students with a 'directed' trajectory chose science or not, they valued science as part of an educational foundation which would help them to achieve their chosen future goal.

Out of 16 students who had a 'partially resolved' trajectory 6 chose science. With reference to Table 5, it can be seen that all 6 students opted to continue with mathematics, 5 students chose to study physical sciences, 4 in the form of mathematics and physics and 1 within a course of aerospace engineering. As we have seen in the portrait sketch, Will took chemistry, biology and pure and applied mathematics A-levels. Their choices were traditional science and mathematics combinations, which could have led to a career in science, but ambition to become a scientist was not part of the longitudinal pattern of ideas for these 6 students. Will typically rejected the idea of deciding upon a specific career in science by the end of year 11 and he selected mathematics to improve his career prospects. Kester, who was keen on both art and drama, chose A-levels to make him 'think a lot', namely physics, mathematics, further mathematics and computing. Mary, for similar reasons, chose physics, mathematics and philosophy and described her choice as an intellectual challenge. Tom K said that his hobbies were media and computers and chose physics and mathematics with computer science and media studies for breadth. The thinking of these students illustrates a general trend among science choosers with a 'partially resolved' trajectory to choose physics and mathematics, because they considered these subjects to be intellectually demanding, strong and versatile and not, at that stage, because the student wanted specifically to pursue a career as a mathematician or a scientist.

Laura was one of 2 people out of 16 with a 'funnelling identifier' trajectory who included science in their post-16 choices. The portrait sketch of Laura demonstrated that her trajectory followed that of the 'funnelling identifier' type as she matched up her perceived capabilities with her subject choices. She was discouraged from taking up sciences, although she chose one science A-level in a mixed A-level combination. A lack of confidence in her ability to pursue science further seems to have contributed to her decisions. Joseph, the other person who chose science and who had a 'funnelling identifier' choice trajectory, became over three years increasingly interested in and more inclined to choose certain subjects. The cut and dried nature of physics appealed to him, but he still retained an interest in the possibility of studying a variety of other subjects including English and geography. In year 9 he said that he probably

would not take French after GCSE and he would not like to do anything with chemistry. Joseph made a positive choice for science and chose mathematics, physics and chemistry at A-level, despite finding science 'more boring this year' in year 11. Joseph's interest in chemistry gradually grew over the years and the nature of the subjects was a strong influence on his choices.

About two thirds of the students with a 'funnelling identifier' trajectory eliminated science from their choices by negative selection. Charlotte, for example, had thoroughly enjoyed primary school science and she had been keen to become an archaeologist after seeing a film about dinosaurs. Charlotte was typical of those with this trajectory who did not choose science, because she found little in secondary school science to interest her, other than selected topics like evolution. Charlotte seemed unaware of the enormity of the field of evolutionary science. Hayley looked for relevance in her science lessons and mentioned the fibre optic camera she had seen in physics. Several students in year 11 remarked that there was less and less practical work in science classes because theoretical aspects of science were saved for the end of the GCSE course, thereby making year 11 more boring. A discourse of increasing antipathy to science in secondary school, described by Kelly (1986) and Woolnough (1996) in the UK and George (2000) in the USA, was detected in the majority of students in this group. As depicted in chapter 5 some students like Carl were openly hostile towards science. There was a trend among students with a 'funnelling identifier' trajectory who did not choose science to achieve higher GCSE grades in subjects other than science and this seemed to have resulted from their negative attitude to science. The model of careers education and guidance that students with this trajectory described seemed to aim to elicit students' ideas about their abilities. The way that careers guidance strategies seem to endorse assumptions about aptitude, based on inherent ability in different subjects, merits further examination.

Of the 9 students with a 'multiple projection' trajectory, only Joanne chose any science with an A-level combination of biology, geography and IT. Students with a 'multiple projection' trajectory juggled with images of themselves in various career roles, which often included science-based careers. Joanne wanted to work in biological science but had considered business

studies and thought that a career in IT might suit her. James B thought about becoming a vet. Katherine saw scientists as people who wanted to discover things to improve the world and she found enjoyment in chemistry, which made her consider a job in pollution control. Michelle once favoured and later soundly rejected a career as a doctor, as evidenced in chapter 5. Sarah J wanted to become a nurse early on in secondary school until she became fonder of art and drama than chemistry and biology. It is among this group that we see clearly that explaining why students do not choose science in terms of a decline in attitude towards science is not always appropriate. Using a more individual approach to choice formation has given us a picture of a group of students whose choices rest upon the non-prejudicial development of stronger tastes in other directions.

The 8 students (out of 13) with a 'precipitating' trajectory who chose sciences were the antithesis of the young scientist committed from an early age. The portrait of Richard who chose A-level physics, mathematics and theatre studies shows a student who had diffuse ideas throughout secondary school and who found choice between subjects to be difficult. He eventually used his own experiences to put together a broad combination of subjects, which he envisioned to be useful for the careers of tomorrow. Science was not chosen with a career in science in mind. Science for students with a 'precipitating' trajectory was a component of what students visualised as a strong and broad combination of subjects, which left a lot of doors open. For those who chose science breadth meant a combination of science and non-science subjects. Mixed post-16 courses are further discussed in section 7.3.2. Students with a 'precipitating' trajectory who did not choose sciences also saw their choices in terms of breadth and opportunity, but for these students breadth did not mean that a science was included in their choices.

Parents of several people with a 'precipitating' trajectory advised their children about the traditional 'educational capital' of some subjects over others, and they were therefore privileged in acquiring knowledge about subjects with high currency for deferred vocational choices. Will was encouraged to pursue mathematics and Simon to select physics over theatre studies because his father considered the latter to be a 'fluffy subject'. The application of the typology to



this selection of a more able sample of students gave sensitivity to the data, which detected this parental variable and which was found to be insignificant in other studies using whole year groups (George, 2000). Students who chose science were made aware of what some people consider to be the value of science in developing *'intellectual skills that serve to fortify the human capital of all students and the economic productivity of the nation'* (deHart, 1998). Students with a 'precipitating' trajectory who did not choose science also sought to choose for breadth and balance and their parents advised them about 'strong' subjects like geography (in Hester's case) and economics (in Sam's case), as noted in the previous chapter.

The typology of choice trajectories illuminated the different ways in which science was chosen among a group of students who were high achievers. The formation of the choice trajectories involved a variety of organising principles. Early commitment to a career involving science was inspirational for the 'directed' trajectory. Leanings towards aspects of science throughout three years helped to form the 'partially resolved' trajectory, and there was a gradual crystallisation of an interest in science among students with a 'funnelling identifier' trajectory. The difficulties of choosing from the full range of subjects among students with either a 'multiple projector' or a 'precipitating' trajectory resulted in post-16 choices that aimed to maintain breadth.

### **7.2.2 Science and Scientists**

Positive attitudes towards science beyond the statutory school age have been associated with interest and enjoyment of science in school (Miller et al., 1999). This seemed to confirm a tacit assumption in the literature (as discussed in chapter 2) that attitude and sciences uptake are causally linked. The link between science attitudes and science uptake could most satisfactorily be applied to the students in this study with a 'funnelling identifier' trajectory, who made up a significant proportion of the sample, (16 out of 69 or 23%). For those who chose science the attitude towards some aspects of science improved over the years, but for the majority attitude declined over the middle and upper secondary school years. The diminishing proportion of lesson time in the latter

half of secondary schooling devoted to practical science activities seemed to contribute to attitude decline.

Tobias (1993) working in the USA found that the difficulties of learning science in the classroom, including excessive pace and the presentation of science as rigid and uncreative, contributed to making science a hard subject for her sample group of non-science postgraduate students taking an introductory physical science course. The post-graduates not only found science difficult, but they were also not satisfied that they had a deep and thoughtful understanding of the concepts involved, notwithstanding the achievement of good grades in the examination. In the present study many students described science as difficult and students who achieved good GCSE science grades, Erica for example, but who thought they were not 'clever enough' to pursue science further, reported dissatisfaction with their science classes. They did not articulate their dissatisfaction with the clarity of the post-graduates in Tobias' study, but their lack of confidence seemed to indicate insecurity in their understanding of science. Osborne and Collins (2000) linked a lack of coherence in the way that science is constructed in school with a relatively decreasing uptake of post-16 science. There was corroboration in the present work in that students regarded the science taught in schools to be overloaded with content and not generally related to working life. Richard called for more relevance for people in his age group. Most students' interests in science were limited to a few favourite topics, like pollution or genetics. For students, like Will, who criticized some teaching and who considered science practical work to be pedantic, science was still chosen despite dissatisfactions.

It is well established that the vast majority of students enjoy practical aspects of science. The universal criticism among the present sample of students about the decrease in the amount of practical activities in science as they grew older corroborates previous research and supports Coles' (1998) point of view that facts, principles and theories have become too dominant at the expense of a broad science education. Coles recommends scientific activity in appropriate balance so that young people have the opportunity to sample a mix of activities which working scientists carry out in their work. Teachers should be made aware of the de-motivating effect of reducing practical aspects of learning

science in years 10 and 11 and should aim to spread practical activities more evenly between the years.

Stables (1996) reported that many secondary school students held stereotypical views of scientists. Furlong and Biggart's (1999) later work demonstrated the narrowness of students' views about science work. The majority of students in the present study who did not choose science used a narrow vocabulary about scientists, which included words such as "clever", "dedicated" and "isolated". They thought that much of the science curriculum was irrelevant unless the aim was to become a research scientist. They held the traditional view, that science teaching is limited to preparing students for a research career in science at the university level (deHart, 1998). Students who chose science subjects post-16 tended to have a stronger awareness of both the general relevance of science and a better concept of the breadth of opportunities within science and with advanced qualifications in science.

Among those students with a 'partially resolved' or 'funnelling identifier' trajectory the majority of students, including those who chose post-16 science, reported a lack of relevance in the way that science was taught. This pointed to a need to broaden both the science curriculum and the students' views of science work. deHart's (1998) recommendations seem to meet these needs: He proposed that we integrate the world of work into science education, with particular emphasis on the evolutionary changes that are taking place in the world of science in relation to the development of the global economy and the information age. Munro and Elsom (2000) found that careers advisors knew little about scientific work so it is not surprising that students in the present study reported a paucity of information about science from careers guidance personnel. Munro and Elsom called for stronger links between science and careers departments to promote awareness of science-related opportunities.

Negative perceptions of science in school and a narrow view of science work were found to be associated with young people's rejection of further science study. From the results of the present study we also begin to understand why students take up post-16 science, despite these perceptions. Students with a 'directed' trajectory took up sciences to fulfil their ambition for a specific career and those with either a 'partially resolved' or a 'precipitating' trajectory

who chose science saw the long term potential of taking sciences in terms of a broad base for a wide variety of careers. There was a tendency for more of the people who chose science to have a view of scientists that was not stereotyped. Students with a 'precipitating' trajectory particularly had the broadest view of what constitutes science work. Osborne and Collins (2000) recommended that students take a core science curriculum plus options but, if adopted, this must take account of the evidence presented here that students, particularly those with 'partially resolved' or 'precipitating' trajectories, are very reluctant to close any doors.

### **7.2.3 Mixed A-levels**

In 1988 when Smithers and Robinson wrote about the growth of mixed A-levels they predicted that students would ignore the arts/science divide by voting with their feet to opt for mixed A-levels, by which they meant sciences in combination with subjects other than mathematics. Of the 69 students who took part in the present study almost a quarter (24%) of the total sample selected courses or A-levels across the arts/science divide.

Reference to Table 2 shows that 15 out of the 21, or 71%, of students who took science beyond the compulsory phase of education chose a course with science and non-science elements or a combination of science and non-science subjects. 6 students, Hannah, Kevin, Joseph, James W, Will and Ian, could be described as having adopted a traditional science/mathematics course or combination of subjects.

The portrait sketch of Laura illustrated the type of student who had a strong interest in science but who, in the absence of encouragement to pursue her interest, opted for a mixture of subjects. Becky, with a 'precipitating' trajectory, eventually chose mixed A-levels, despite active discouragement of her choice of biology with English and theatre studies. Over a decade after the publication of Smithers and Robinson's (1988) work students seem to be still 'voting with their feet' for mixed A-levels, despite advice from school for them not to do so. There were strong indications that many in this sample of secondary school students saw the importance of the media in modern life and that many who chose science linked this awareness with the possibility that science would be

applicable to technical aspects of media production. The sixth-form colleges have been seen to be more encouraging of this kind of 'mixed' A-level choice.

Ainley has shown that early achievement in mathematics predisposes students towards a physics choice (Ainley, 1993). This is substantiated in the present study because a facility and/or affinity with mathematics can be detected in the discourse of students who consider physics along with mathematics. Physics is generally regarded as a mathematics-orientated subject and all students except one who chose physics also chose mathematics. 9 out of the total of 21 students opting to include science in their post-16 course chose physics and mathematics with third or fourth non-science subjects for the majority. The third or fourth subjects were chosen from \*computer studies\*, economics, media studies, philosophy, and photography or theatre studies. Only 2 students out of the 9, Joseph and Ian, opted for traditional mathematics and sciences combinations (physics and two mathematics or physics, mathematics and chemistry or biology). Other researchers have commented upon the physics and mathematics linkage in post-16 choices, but the strong tendency to mix physics and mathematics with non-science subjects has not been previously reported.

#### **7.2.4 Gender and Science**

The gender pattern that more boys than girls (15 to 7) in the present sample of students chose science was detected, as was the tendency for boys to choose more physical science-orientated and for girls to choose more biological science-orientated courses (see Table 5, p149). Dekkers (1992) using a sample of students across the attainment range, found that parents gave gendered advice, but with this group of students, all of whom had above average achievement, there was no evidence of gendered advice. All students reported that they were encouraged by their parents to make choices with which they would be happy.

The premise that girls are most likely to have come to a decision to take science in order to pursue a career as a scientist could not be sustained with the

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\* It is arguable whether computer studies comes into the arts or science side of the divide

student sample used in the present research. Girls who chose science, like boys, described choice trajectories from each trajectory type and chose science for similar reasons to boys. Demonstrating a 'directed' trajectory, Erica's vocational projection to be a PE teacher led her to choose a science A-level, whilst Hannah made all science choices because she was interested in a medical career. Mary, with a 'partially resolved' trajectory, Laura, with a 'funnelling identifier' trajectory, Joanne, with a 'multiple projection' trajectory and Becky and Hester ('precipitating') all chose mixed A-levels and only Hester had a possible, though not certain, career idea to become an archaeologist.

The male image of physical sciences has been the focus of gender-related research in science education; see, for example, Archer and Freedman (1989). Boys have been found to be more likely to identify with a career in science (Whitehead, 1996). Boys' particular identification with physical sciences has been attributed to their experiences of more physical-science related activities, such as model cars and computers (Jones, Howe and Rua, 2000). Male images of physical science have been found to lead to underachievement among girls and a lack of interest in pursuing physical sciences post-16. In the research reported here 9 students, of which 8 were boys and one was a girl, chose physics in a mixed A-level combination. Boys seemed to be more aware of the possibilities for physics in a mixed A-level combination. The implication that boys doing physics tend to be on the 'science' rather than the 'creative' side was belied by the evidence in this thesis, which showed that boys were interested in creative writing, drama and theatre studies and that their attitude to the arts was mirrored by students who did not choose any science beyond compulsory school. As evidenced by his portrait, English was one of Will's favourite subjects throughout school and in year 9 he would have liked to take expressive arts if he had had enough options for GCSE. The girl who chose physics described physics lessons as 'not particularly inspiring' but she hoped for better in the future. Mary chose physics on the basis of the intellectual challenge of the subject. Like many of the girls interviewed, Erica thought that neither physics nor chemistry would be useful to her personally in the future. Despite reports of the effectiveness of girl-friendly physics strategies (see Rosser, 1993 or Jorg and Wubbles, 1978) there is no evidence among the students that

making physics more attractive to girls has been addressed in any of the six schools in the study.

Dearing, in the 1996 report, identified achievement as a motivating factor in the selection of post-16 choices. In the present sample of students, selected on the basis of their above-average attainment level, underachievement as a factor in choice about science was not often pertinent. There was, however, a difference between boys and girls. Boys who were high achievers in science had a positive view of their own potential. Richard liked physics because it was about things that you see around you. Reuben explained his choices of mathematics, further mathematics, physics and psychology as subjects that he was good at and that would not narrow down possibilities. There was an intrinsic assumption in the choices of the boys that they were capable of studying post-16 science. In contrast, girls were less likely to be motivated by achievement to choose science. The evidence showed that girls were more likely to misjudge their own potential in science as noted in the portrait of Erica. Andrea, Debbie and Shelley all achieved high grades in all GCSE subjects including science (AA or BB). Debbie expressed her dislike of physics and mathematics and was astonished by her predicted AA science grades. Andrea, although she agonised over her choices between the subjects, including chemistry and biology, throughout the three years of the study did not feel that she was sufficiently talented in science to continue to study science. Andrea achieved grade B in each of the three separate sciences. Her deep interest in training in music and drama eventually tipped the scales away from science. Shelley commented that she would have taken one of the sciences for their usefulness if she had more confidence. By the end of year 10 Kimberley, who had a keen interest in science in year 9, said that she found she was not a 'sciency' sort of person and pointed to her predicted B grades in mathematics and sciences and predicted A grades in all other subjects as evidence. Several girls matched their own apparent, but misjudged, abilities in science to their perceptions of the standard of achievement required to study science further and found them to be wanting. This conclusion further explains Lightbody and Dundells' (1996) finding that although girls agreed that women could be scientists, they did not see science as a career for themselves.

Gendered images of scientists like those Jody described, with mainly boys doing science, were not confined to students with a particular type of trajectory. Gender issues did seem to be addressed in personal and social education in schools, since in the middle secondary years some students made gendered comments, which they later retracted. One illustrative example from a year 11 interview is quoted here.

I: Would you like to comment on something that you said in year 9. I am quoting here. 'Obviously for girls textiles is more important'.

Ans: Oh, no I take it back. Lots of boys do textiles here.

Students, when asked what sorts of people do science, often did not mention gender and, like Charlotte for example, said that pretty much anyone with an interest can do science. What seemed to be critical for students who did not have a gendered idea of scientists was their inability to project themselves into the role of scientist.

### **7.3 Different Ways To Choose Science**

By relating the typology of choice trajectories to the *modus operandi* for choosing science, I conclude that the situation has moved on since Head (1997) wrote about science students coming from the 'foreclosed' group, adopting identities created for them by others according to Marcia's (1980) identity categorisation. With the small sample of 21 students who chose science post-16 it was demonstrated that science was chosen by students with widely differing choice trajectories, the commonest of which was the student with 'precipitating' trajectory, the least 'foreclosed' trajectory type.

For those who chose science from the 'directed' group sciences were needed for a specific career ambition and in the 'partially resolved' group there was generally an interest in particular aspects of science, which was stronger than for other curriculum subjects. People who chose science were poorly represented in the 'funnelling identifier' group, with a majority of those who did not choose sciences expressing an antipathy to science as a reason for not including it among their seriously considered options. It is the latter group of students that seem to have been depicted in research studies where images of



science occupations, opinions of the science curriculum, the way science is taught and the relative drop in post-16 science uptake have been assumed to be causally related. Opinions about science in school or the school curriculum did not seem to be significant influences for the potential advanced science student with a 'precipitating' trajectory. These students constructed their ideas about choice with the same open-mindedness with which all people whose trajectories fall into the 'precipitating' category tackled choice. The ways in which students' ideas changed as they approached post-16 choice was variable and (within the sample selected for the present research) never as closed-minded as implied by the criteria for Marcia's (1980) 'foreclosed' types.

A single specific parental input deserves particular mention because of its relationship to ideas about implicit educational values passed down by generations and known as 'cultural capital' (Bourdieu and Passeron, 1977). In addition to significant contributions from parents in the form of encouragement and validation of choice, some parents recommended what they understood to be 'strong' subjects. Parents affected the choice trajectory when they urged their children to consider physics or mathematics (or economics), because they knew that these subjects were seen to be challenging and respected subjects, particularly by admissions tutors to university.

Evidence from Roker (1993) about career guidance in private girls schools showed that what she called '*getting the edge*' was a well worked out strategy centred on early and detailed career planning. This strategy, coupled with the statistic that 50% of A-level science examination candidates come from private schools, even though they constitute less than 10% of the sixth form population, has given the impression that students choose science in a foreclosed manner. The interpretation of evidence from the perspective of Roker's study, in which girls in private schools were actively encouraged to choose a career by the middle years of secondary school, leads to the conclusion that girls choose science because science is needed for specific careers. Gallagher *et al.*'s (1997) idea that girls choose science because they see labour market opportunities could only be borne out for students with a 'directed' trajectory in the present study who had a clear vocational projection.

Students who sought breadth in their post-16 choices made the mixed A-level choice. Most had no fixed idea about a future career and saw mixed A-levels as a way of keeping career options open. There is evidence that some students were given advice by careers advisors against taking mixed A-levels. Some students accepted the advice and some still '*voted with their feet*' and did mixed A-level against all received advice (Smithers and Robinson, 1988).

The study by Hill and Wheeler (1991) about images of science suggested that students do not have a well-rounded appreciation of the nature of science and the work that scientists and technologists undertake. Pharmacists and media technicians, for example, were not considered to be doing scientific work. In the present study the majority of students who chose science were distinguished by their deeper appreciation of what one might expect in a science career. A more detailed picture and diverse range of science occupations were described by most of those who chose science, despite evidence that such understanding had not been acquired in the science classroom.

As discussed in chapter 3 adolescents match possible selves (defined as conceptions of the self in future states) with a personally evaluated self to make decisions about the future (Leonardi *et al.*, 1998). Disappointment with school science has been related to students' inhibitions with respect to the further study of science. I have found that two other powerful factors militate against a post-16 science choice. The first is a lack of knowledge about science occupations and science work that is particularly apparent among those who decide against taking science past the age of 16. The second is the effect of a self-perception among those students who achieve highly at GCSE, but who envision their science ability to be much lower than their achievements would indicate. These students are therefore handicapped in the task of constructing their ideas, because they have a hazy picture of what their possible selves in science could be like and a deflated self-esteem with respect to science achievement. This helps to explain further Rosser's (1995) finding that students do not see scientists as people they could grow up to be.

The present research has confirmed Miller *et al.*'s work about negative attitudes towards science in school and Osborne and Collins' (2000) work about students' disenchantment with the school science curriculum. By focusing on

the choice trajectories of individual students, I have found that some students, particularly the majority of those with a 'funnelling identifier' trajectory, eliminated the possibility of post-16 science on these bases. However, our understandings of science choices have been extended by exemplifying the trajectories of choice for students who choose science and by demonstrating that students from the sample in the present research have chosen science even when it was not their favourite subject and when they did not find science at school to be particularly interesting or enjoyable. What makes students choose science, other than reasons of interest and enjoyment, is their confidence in their own ability to do science and the association of good future career prospects, not necessarily science careers, with post-16 science courses or A-level sciences.

The findings inform our notions of the ways in which young people elect to include science in their post-16 education or training. The relationship between choice trajectories and the uptake of post-16 sciences demonstrates that students' ideas change in ways which depend on the ends for which choice is made, and the choice trajectories of future post-16 science students are found in all groups of the typology. There is no one way to choose science, as other workers in the field have implied, but a variety of ways which have been illuminated by the use of the typology of choice trajectories developed in the preceding two chapters.

Preconceptions about a single trajectory of choice for a person who takes science are not helpful in guiding student choice or encouraging a higher uptake of sciences. It would be more informative for professionals who help to create the landscape of choice to be aware of how and why students choose science. The findings indicate that science educators should do all in their power to break the stereotyping of both young people who choose science and of working scientists. Caution should be exercised in recommending initiatives based on trends, which are then applied to all individuals in the population. One size does not fit all, as the former secretary of state for education and employment for the period 1997- 2001, David Blunkett, was fond of saying.

## **CHAPTER 8 CONCLUSIONS**

### **8.1 Introduction**

In this thesis I set out to understand more about the formation of post-16 choices by addressing two questions. The first was about the way that individual teenagers' ideas change during the last three years of school, and the second was about how the changes in students' ideas affected science choices.

A particular area of concern was what lay behind the figures for a relative decrease in participation in science courses among young people in post-compulsory education. I evaluated the importance of the downward trend by considering a debate about whether maintaining the level of advanced level science students relative to those taking other subjects serves the national interest in the UK. On the basis of commentaries, which have continued into the 21<sup>st</sup> century, I concluded that the uptake of sciences continues to be a live issue, both educationally and politically.

The next step was to find out how the decline in post-compulsory science had been addressed. Research to date into young people's choices generally, and about science in particular, has given us a broad view of students' ideas about post-16 choices, largely focusing on trends in attitudes sampled at a particular time. This has been useful in developing strategies to combat negative attitudes towards science. Curriculum initiatives aimed at improving science education have resulted in changes in practice and improved examination results. Political concerns have led to the central place of science as a core subject in the National Curriculum of primary and secondary schools. These strategies have resulted in measurable progress in scientific literacy among school students, evidenced as improvements in performance targets, but not yet in an improved post-16 uptake. Some researchers have turned to an exploration of the affective domains of choice and attitudes to science to try to discover the basis of student decision-making. Current approaches in the affective domain have revealed trends in students' ideas about choosing

science. The drawback is that dominant factors that operate in the areas of choice or ideas among student populations tend to be paramount and at the expense of the more subtle interplay of factors that affect the formation of choice.

My research was located in the affective domain, with the emphasis on individual student's thoughts and feelings about choice in order to learn how students make their choices and to uncover factors that may go undetected in whole population trends. The lack of a temporal aspect in much of the research to date can only give a snapshot of students' ideas and, therefore, limited insights into how decisions are made. Connections between single factors and the uptake of sciences have often been made on the assumption, which has not been clearly substantiated, that negative attitudes to some aspects of science will result in a rejection of the subject post-16. I followed suggestions expressed in government reports and by contemporary researchers that the way in which students' ideas are formed should be more deeply explored. A recent report for the DfES by Roberts (2002) for example suggested that one of the main factors in improving pupils' enthusiasm for science lies in the affective domain.

I designed a longitudinal study to capture the individual student voice so that the factors that formed choice and, in particular, choice about science could be explored. Since science is chosen from a menu of post-16 options, I found that broader issues about students' choices inevitably encroached upon students' ideas about science. I set up interviews to encourage students to talk periodically about their experiences of choice over three years. Grounded theory enriched by a form of discourse analysis was applied to the empirical data collected for the longitudinal study. The qualitative analysis of rich and powerful data revealed patterns in the changes in students' ideas over time. I found heterogeneity in the way that post-16 choices were formed among a sample of students who were in the upper half of the achievement range of 13-16 year olds. The thesis that changes in students' ideas about choice can be modelled as a typology of choice trajectories makes progress in unearthing the basis of student decision-making and is explanatory of post-16 choice about science.

The way in which changes in students' ideas over time affect choice in relation to science was examined by the application of the typology of choice trajectories to decision-making about post-16 science. The results provided a foundation upon which to begin a critical appraisal of current notions about the way that science is chosen by students in schools and colleges. On the basis of questions that have been raised by this study I will make some suggestions for further research.

## **8.2 Outcomes Of The Research**

The central contribution of this thesis is a theoretical development in the field of young people's decision-making. I have developed a typology of choice trajectories that gives an enhanced understanding of the ways in which students tackle choice. The typology shows the different ways in which individual students' ideas changed along a trajectory that was moulded by the interplay of a variety of factors and the timing of student self-definition with respect to post-16 education.

Early commitment to a specific or general career direction typified students with 'directed' and 'partially resolved' types of choice trajectories respectively. Funnelling of ideas was characteristic of the student with a 'funnelling identifier' trajectory. For students with the 'multiple projection' trajectory vocational commitment was weak and the trajectory is formed by consideration of many vocational possibilities over time. Students with the 'precipitating' trajectory were committed to broad educational aims with active avoidance of vocational commitment. The typology of choice trajectories was elaborated to demonstrate differences in the ways in which students make use of incidental and structured, material and personal resources for guidance in and out of school in a way that was characteristic of their choice trajectory.

A further theoretical development was the use of a method of data analysis that was influenced by the considerations of grounded theory and a particular genre of discourse analysis. Whilst neither approach is new in the analysis of empirical data, I have combined the two approaches in an innovative way in the service of a longitudinal study. A departure from the majority of previous

studies in the area of student choice was that theoretical development was informed by individual students' ideas that could be lifted from the data as opposed to categories imposed upon the data. Each data-sampling period was informed by analysis of data from the previous sampling stage using a grounded theory approach to identify issues that were pertinent to students' choices. A form of discourse analysis was used which led to the discovery of longitudinal differences in students' thinking.

The research acknowledges Marcia's (1980) theory of identity statuses in eliciting thoughts about more than one pathway to choice, but rejects the inflexibility of stereotyping people in mid-adolescence (the subjects of my research) into identity statuses. I demonstrate the way in which the typology of choice trajectories provides explanations about the multiplicity of ways in which the present-day teenager, going out into an uncertain world, makes choices. Analysis of the empirical data has demonstrated that the way in which the formation of post-16 choice works in practice for this group of students is that individual students actively construct their choices. The timing and degree of commitment to a vocational projection are strong influences on the change of ideas across time.

As well as expanding our knowledge about the way in which secondary school students' ideas change as they make choices, I have also contributed to our thinking about the way in which students in the upper half of the attainment range are advised about future career pathways in the last three years of secondary school. The analysis of interview data has resulted in a novel way of thinking about choice that emphasises diversity in approaches to post-16 choice. The effect of choice guidance does not impact on all students in the same way, and there is diversity in the way that students use the resources that are available to them to support their choices. I have concluded that a student's ideas about the relevance, usefulness and effectiveness of school support are related to the form of their choice trajectory. This raises our awareness of different needs that students have for choice guidance in relation to the choice trajectory that they follow. Future conceptualisations of how teenagers structure their decision-making may be reviewed and the operation of choice guidance modified to take account of the multiplicity of choice trajectories.

The second major outcome of this thesis is the application of the typology of choice trajectories to the specific case of choice about science in answer to the second question that I posed about choices in relation to this subject area. The multidimensional nature of the different means by which science is considered as a post-16 option demonstrates that a dislike of science or aspects of science is too simplistic an explanation for the relative decrease in post-16 science uptake. The distribution of choices in favour of or against science in all groups in the typology of choice trajectories demonstrates that the reasons that students make particular choices may be just as variable and complex in the case of science as in the case of choice generally. Therefore teaching science in a way which makes students aware of the potential of further study of science will contribute to informed choice. The limited image of a working scientist was found to be a factor in the negative image of science careers among students. A similar image, by implication, of the student who makes a positive science choice was found to be demonstrably inappropriate for today's science choosers.

### **8.3 Limitations of the Study**

The study collected data from a sample of students with an above-average academic profile, who lived in a fairly prosperous small town in the UK. Since the research started with concerns about science uptake, the selection of the sample on an attainment basis was justified by reference to the higher likelihood that students from this sample would choose post-16 science. The narrowness of the student socio-economic grouping precluded exploration of socio-economic issues in connection with secondary student choice.

In a small-scale study generalisability is an issue and I cannot make claims that findings would be reflected in similar groups of students throughout the UK. Generalisations can only be cautious because of the small-scale nature of the research, the geographically confined sample and the restricted attainment and socio-economic range of the students. However, a substantial amount of primary data from 69 interviewees taken from six schools over three years has led to some novel and useful insights into students' approaches to choice in comprehensive schools, which researchers and practitioners may recognise. The



findings give impetus to a critical discussion about assumptions inherent in the guidance of choice and in the choice of post-16 science.

Interview dates were chosen to coincide with critical events in the school calendar, although these were not necessarily important events in life of a teenager. Nevertheless, the timing of data collection was considered to be within the students' frame of reference. Following pilot activities, interview questions were framed in appropriate terms, but students may have had different understandings of the scope of the questions. When asked about careers education and guidance, for example, students may have included or excluded 'in-house' activities. The data may also be limited by what students remember and they may have given edited versions of what they really thought. However, what could be considered to limit the analysis from some viewpoints is here considered to have contributed to theoretical development. The manner in which students interpret interview questions and the information they selected or discarded was counted as significant in the construction of their ideas. The data collected were limited in two respects. From the data I was unable to model the balance of inside/outside school influences or how formal and informal cultures interacted to affect the formation of choices.

Issues of gender have been raised in the data, but could not be effectively addressed with respect to the typology of choice trajectories which did not demonstrate clear gender relationships across the groups.

## **8.4 Implications For Choice Guidance**

Current education and training policy discourses in Britain often focus uncritically upon notions of markets driven by choices made by customers. I have indicated that most students did not consider that the strategy of making career aspirations the starting point of guidance is always the appropriate way to proceed. Therefore, my contribution is important in enriching our understanding about the different ways in which young people make choices in their role as the customers of post-compulsory education and training.

Careers guidance literature recognises that students (clients) should be alerted to a variety of opportunities, but this is not recognised by the students in this sample. They describe two models of careers guidance that operate in the

careers service. Those with a 'directed' or 'partially resolved' trajectory who have a strong idea of a future destination, are narrowly advised. The former are advised about pathways to their presumed career and the latter are advised within their domain of choice. Students with other trajectories have broad ideas and are loosely advised to choose subjects that they like and in which they have achieved good standards. Students who were both resolved to do A-levels and undecided about vocational projection found that careers guidance had no detectable effect in the formation of a choice trajectory. The operation and the basis of careers education should be scrutinised to take into account the different needs that students have for guidance at different points along their choice trajectory. However, narrowly-focused careers advice should be avoided in view of the introduction of the national framework (DfEE, 1999) designed to maintain breadth in post-16 education. I recommend a much stronger emphasis on careers advice that encourages students to explore a variety of possibilities and to keep options open.

The time and care that students put into their choices are not reflected in the level of support given to them by teachers in school. Research about careers guidance from Manchester education department concluded that the dual academic/pastoral role of teachers has resulted in unreasonable expectations (Manchester, 1997). Students in this study understood the priority that teachers gave to their academic role. The dividing line between PSHE and careers education seems hazy and some students are taught to examine their strengths and weaknesses in school subjects from a perspective that is similar to trait theory. This resulted in anxiety about making an educational rather than a vocationally-based choice. Some students with a 'multiple projection' or a 'precipitating' trajectory were grateful for good advice about post-16 choices obtained at sixth-form colleges. Staff at the colleges seemed to have more appropriate expertise than schools, with which to advise those students who are yet to be vocationally committed. If it cannot be managed in schools, it may be advisable to hand choice guidance for students preparing for sixth form studies, and the resources allocated to choice guidance in schools, to the colleges or sixth-form centres.

The computer assisted careers programme (CACP) used by year 10 students in school is based on a system of 'forced choices' that results in a list of potential careers. This can be puzzling for many students, particularly those with high academic potential whose list contains suggestions like swimming pool attendant or shepherd. Clearly the system is limited by the size and operational parameters of the database. Students seek to know the basis upon which a list of potential careers is made. It may be useful for them to have this information in addition to the list itself, since it may be able to reveal some drives, abilities, attitudes and beliefs that are widely recognised to contribute to decisions.

An understanding of the impact of work experience on students, according to their choice trajectory, can help to make the experience more relevant to them. For some students their physical presence in the workplace for two weeks may not be necessary to help them learn about the world of work. I suggest that, in some cases, alternative experiences such as project work involving contact with the workplace may be more appropriate.

The typology of choice trajectories provides a theoretical basis for re-evaluation of the underlying assumptions about careers guidance in schools. The career decisions made by the young people who are 'the customers' have become central to both the planning and operation of policies, but take little account of the variety of choice trajectories which give rise to different needs for different students. Students who are leaving school at 16 seem to be given high priority for focused careers advice; yet students who struggle to identify a post-16 educational or training pathway may be equally in need of guidance.

Careers education can be improved by considering the choice trajectories as a basis for differentiated choice guidance, whilst still recognising that those who seem vocationally resolved need other options laid before them in order to meet their identified needs to make informed choices at 16. Although students understand teachers' priorities and appreciate the reassurance and validation that teachers provide, they have need for teachers to bring the world of work into the classroom.

## 8.5 Implications For Science Education

When viewed in relation to choices about science the typology of choice trajectories encourages a re-examination of views about how science is chosen from among available options, and offers the opportunity to broaden science education and to raise awareness among students of the potential of studying post-16 science subjects.

Students with different choice trajectories chose science in different ways. Some had a long-standing interest ('partially resolved') or a specific career in mind ('directed'). Students with a choice trajectory of the 'multiple projection' or 'precipitating' trajectory types were equally likely to choose science, not because of a vocational commitment, but because of a belief in the value of the breadth of experience obtained from studying sciences, especially in mixed A-level combinations with non-science subjects. The paucity of students with a 'funnelling identifier' trajectory who chose science seems to suggest that previous research using single cohort sampling has captured thinking among students who have a trajectory shaped by a gradual focusing down of ideas by negative selection over several years. By following changes in students' ideas by using longitudinal sampling, I was able to capture positive thinking about science among those who eventually did not choose science post-16 and vice versa. James B, for example, had considered becoming a vet but may have been seen as somebody who had never considered science. Science teachers are alerted to the interplay of factors that motivate students to choose science.

Students motivated by good teaching to achieve highly in science often did not consider further science study. Students clearly articulated their understanding that teachers' duties are guided by the political agenda of the day, the 'delivery' of the National Curriculum. The flavour of the current political climate permeates students' descriptions of the work of their teachers, who are seen to be doing a good job in helping students to do their best in examinations. Students are well aware of schools' aims in the light of the establishment of national 'league tables' of schools' examination results. Improved performance indicators have not been even a part of the answer to the problem of how to stimulate interest in post-16 science.

One of the reasons that secondary school students are not giving serious consideration to further science study lies in the way in which school science generates images of science work. This leaves many students with the impression that science work is narrowly focused on discovery research in an isolating work environment. Students often communicated caricatures of scientists from the media. Most students were unaware of the potential of science for either broad knowledge (valued for entry into higher education) or for a wide range of science work. Students who chose science were more likely to have gained awareness of science opportunities from outside school or by their own research. Choice trajectory formation was rarely influenced by aspects of science teaching or careers guidance that gave insights into the broad opportunities available to those with post-16 sciences. There is scope for teacher influence here. I would like to argue for the teaching of science in a social context fashioned by the interests of young people, so that the profile of science-based careers in food and human nutrition, diagnostic radiography and forensic medicine, for example, may be raised. The establishment of vocational study as a recognised route to becoming a scientist or engineer may encourage more students to choose science.

My recommendations resonate with those from related research, such as that of Osborne and Collins (2000) and Coles (1997), that teachers should connect school science with today's technology and with science work, if we are to encourage more people to take sciences post-16. The president of the Royal Society of Chemistry for the year 2002, Sir Harry Kroto, described the perceptions and the reality of chemistry as hopelessly mismatched (Giachardi, 2002). He pointed out that the UK is home to world-class chemically-based industries worth £34 billion. BEES, the Biochemical Engineering Education Scheme, is a recent example of a project that teachers can adopt in their schools to raise awareness of openings in science (Neumark, 1999). Malmberg (1996) contends that information gathering must be encouraged so that adolescents explore their future options, opportunities and constraints.

This research has touched upon the role of parents and gender factors that influence choice. A relevant finding was that parents gave advice about subjects that they considered to have high prestige and these were often versatile

subjects encompassing many generic skills. Previous research, which has demonstrated gender-related difference in the matching between self-perception and a career in science, was supported and extended. Most strikingly, boys were found to be more confident about their potential to study post-16 sciences, whereas girls tended to have a lower self-esteem and to lack confidence in their ability to be successful in post-16 sciences, despite achieving as highly as boys at GCSE.

An important finding was that disenchantment with some aspects of school science does not necessarily amount to the student switching off from science. Choice at 16 is multi-influenced as well as differently approached. An awareness of the differences in the ways that students select post-16 science supports the conclusion that more students require a better understanding of the work that scientists do and the way in which they do it, in order to make the kind of informed decisions proposed by Dearing in 1997. How teachers will be able to contribute to these insights requires a resolution of the conflict that is generated between what teachers consider to be *de jure* and *de facto* responsibilities in the classroom. Whether future curriculum changes and the level of central government control will affect the way in which students experience choice remains to be seen and to be researched.

The student voice has provided the primary data for my research and students contributed their ideas as to what could be done to improve the uptake of science post-16. They suggested that science should be made more practical, more relevant and more applied. I leave the reader with a selection of students' ideas.

Charlotte: I think it has to be changed somehow, but I don't know how. It has such an old-fashioned feel to it. You wouldn't imagine that BSE existed or that GM foods were an issue.

Kelly: Science is so many things. I would just make it common sense.

James B: I know I can't fix a washing machine, but I want to know enough so I don't get conned into paying too much for a repair.

Kieran: More practical, more projects. I would look at things in an applied way. We should do more practical in years 10 and 11. After you do your investigation, you should be good at practical.

Michelle: Make it more appealing.

Richard: Slim down!

## **8.6 Further Research**

The heterogeneity of trajectories for the student sample of 13-16 year olds from the more able half of the school population has shown that the needs of different groups of students within the above average attainment range are different when they are making choices about post-16. Now that the ways in which students make choices has become clearer, the approach used can be employed to explore differences among the wider school population by changing the scope of the sampling frame in a variety of ways. Lower attaining students who are not likely to reach GCSE grade 'C' by the time they leave secondary school could be the subjects of a similar study. The distribution of choice trajectories among a larger population in a variety of schools with different socio-economic profiles or in education authorities across the UK, for example, can be determined so as to meet different needs for choice guidance. Schools from the private sector could be included to give opportunities for comparison so as to discover what different sectors can learn from each other.

Further work could contribute to practice. There could be a focus on a sample of students with a particular type of trajectory to explore ways in which their needs can be addressed in school. Research among teachers, of both science and other subjects, could reveal what assumptions they make about the professional role of scientists, or whether they are aware of students' expectations of a more proactive approach to careers guidance. Parents' experiences with respect to their children's choice are little known and a study about what parents know about choice guidance, and the ways in which parents experience and influence the choice that their children make would be helpful in improving the value of parents as a resource for student choice.

The study lasted three years and was limited by available resources. Time was a constraint and a longer study would have shown how each trajectory continued into each student's post-16 study or even further into the work place. This would contribute to our understanding about how post-18 choices are made and possibly how post-16 choices contribute to success in post-16 destinations. By widening the possibilities even further the typology of choice trajectories may be applied to other settings in which choices are made, such as

choices after higher education or training, choices of mature students or of people in mid-career. The theory of personal constructs (Kelly 1955) puts the stress on personal meaning, and research in this thesis has shown how each person has constructed their individual reality and then made their choices ready to move on to the next step in their education. As Kelly (1955) so elegantly stated that with every human engagement, every relationship and every personal undertaking we build extensions to our personal understandings and venture our next commitments.



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## **Appendix A: Interview Schedules**

### **INTERVIEW SCHEDULE: Year 9 Pre-Option**

#### **SECTION 1: SUBJECT INTERRELATIONSHIPS**

1. What pieces of work (or projects or visits) have you done in the last year, which involved more than one subject?

PROBE: What did you do? Any other pieces of work?

2. Which subjects help you with other school subjects?

PROMPT: Just as an example, art might help in technical drawing.

3. Which subjects are related/connected to each other?

PROBE: What makes you say that?

#### **SECTION 2 : SUBJECT IMAGE AND CAREERS AWARENESS**

4. Have you had any careers education in school?

PROBE: Where did it come from?

5. What ideas do you have about what you'd like to do when you leave school?

PROBE: What has made you think about this? (If school not mentioned) Is there anything in school, which has made you think about this?

1. I'd like to hear your opinion about the sort of people who go into certain careers

PROBE: What sort of people become historians? What sorts of people go into business? What sort of people become scientists?

7. What sort of skills/qualities would they need for the careers I mentioned?

PROMPT: Historian

Businessperson

Scientist

8. How would you describe the teachers in the science department?

PROMPT: If you did not know would you be able to say what subject they taught?

9. How would you describe teachers in the English department?

PROMPT: What are they like?

10. What subjects would you make compulsory for all pupils at GCSE?

PROBE: Why did you choose (according to answer)?

Probe for meaning

11. What have you found out about careers from your subject teachers?

PROMPT: Anything else?

or Have any careers been mentioned in subject lessons in passing ?

12. Imagine that you had to choose a career in science. What would you choose?

PROBE: Why? Check for meaning

13. When you are being told about careers, what sort of things would you like to learn about?

PROBE: When should it start?

### **SECTION 3: SUBJECT PROFILES IN SCHOOL**

14. When you think of school which subjects put things on around the building and in whole school things?

PROMPTS: Displays of work Assemblies

15. Which subjects put things on that are also for parents and people outside of school?

PROMPTS: Lectures Concerts

16. Which subjects run activities for pupils in lunchtime and after school?

PROBE: What activities do they do?

17. Which ones do you do?

PROBES: Have you thought about joining anything (else)?

Which ones did you go to last year (Year 9 only)?

What sort of people goes to the sports activities?

What about music?

Science activities?

18. What would encourage you to go to a sports activity?

19. What would encourage you to go to a science activity?

20. Have you been on any visits/ trips from school in the last year?

PROBE: What did you learn from that trip?

PROMPT: Any others?

#### **SECTION 4: IMPRESSIONS OF SUBJECTS**

21. What subjects do you like?

PROBE: What do you like about them? Probe for meaning

22. Are there any subjects you particularly dislike?

PROBE: Why is that? Probe for meaning. Any other reason?

23. Which topics do you find most interesting in science?

PROMPT: Environmental chemistry, like acid rain for e.g.

24. Do you enjoy any of the science activities/which science activities do you enjoy most?

Projects    Experiments    Making Things    Discussions    Posters

Finding Out

PROBE: Why? - and check understanding

25. What do you think of English as a subject?

**PROMPT:** What sort of things do you do? Which things do you like and which things don't you like?

26. Would you like to make any comment about any of your school subjects?

Anything I haven't covered?

**PROMPT:** Length of the lessons, for example.

### **INTERVIEW SCHEDULE: Year 9 Post-option**

Q1. What did you think of the SATs tests?

**PROBE:** Which was the hardest subject? Why did you think that?

**PROMPT:** Ask about the other two subjects, order of difficulty.

Q2. In the science SATS, which sorts of questions did you find the hardest?

Show examples of biology, physics and chemistry questions

Q3. What are SATS for ?

Who wants to know the results ?

**PROBE:** Did SATS have any benefits for you?

Q4 (a) Does everyone have to do double English in Year 10, that is language and literature?

**PROBE:** Do you agree with that?

Q4 (b) Does everybody have to do double science? Do you agree with that?

**PROBE:** Is anyone allowed to do three separate sciences in this school?

Does it depend on ability?

Can you continue with science if you take the double option?

Q5. What have you chosen for your options?

Q6. On what basis have you chosen your options?

Did you choose subjects with post-16 in mind? I mean thinking ahead to after you have done your GCSEs?

**Q7. Were there any subjects that you would have liked to continue but you couldn't fit into your option choices?**

**PROBE: What would you like done about that?**

**Q8. What subject would you not take if you had a free choice?**

**Q9. When this school comes up to options, what do they do?**

**PROMPTS: Did any subjects give a talk?**

**Did separate subjects do anything?**

**Has any subject run any special events since January, like a visit or a competition for example?**

**Q10. What help did you get in choosing your options?**

**PROMPT: Teachers? Family?**

**PROBE: Did you discuss any options with friends?**

**Q11. Would you say that your parents agreed with your choice disagreed or they accepted what you chose?**

**Q12. When you chose your option subjects did you choose subjects to go together or did you choose subjects separately?**

**Q13. Did any of your teachers tell you about subjects that go together?**

**Q14. Did English teachers tell you what might go with English? What about mathematics? Science?**

**Q15. Were you advised against doing any of your subjects? Do you know why?**

**Q16. Did you read this booklet from the Cambridgeshire Careers Service?**

**PROBE: Did you find the careers booklet helpful?**

Q17. What have you had in the way of careers education since January? Who took you for careers lessons?

Q18. Have you done any activities that have made you think about the kind of person you are?

PROBE: Are there certain things that you are good at?

PROBE: Do you have any particular interests in or out of school which might be useful for a future career?

Q19. Have you decided against taking any of your school subjects after you leave school?

Q20. Have you had any ideas about what you'd like to do after you leave school?

Q21. What subject teachers spoke to you about the kind of thing you can do with their subject post-16 ?

PROMPT: What did they say?

Q22. Have the options had any effect on the way in which you think about your future?

PROMPT: Made you think about a career direction for example?

PROBE: Do you think that these choices should be made at your age?

Q23. What are you most looking forward to in year 10?

Q24. Anything you want to ask me?

## **INTERVIEW SCHEDULE: Year 10**

1. How have you been getting on with your GCSE courses ?

PROMPT: Which ones are you enjoying most?

**2. I'd like to ask you about subjects you think might be useful in the future.**

**Which subjects might be useful as part of home life or leisure?**

**PROBE: In what way?**

**What subjects might be useful for a career?**

**PROBE: How will they be useful?**

**PROBE: Do you see any subjects as not so useful for either home or working life?**

**3. In your lessons do your teachers explain how the work can be applied to everyday life?**

**Do you teachers explain about careers connected to the work you do in class?**

**4. Here are some questions that I asked you at the beginning of year 9.**

**I'd like to know what you think now.**

**(i) What sort of person becomes a historian - what sort of skills do they need?**

**(ii) What sort of person becomes a businessperson - what sort of skills do they need?**

**(iii) What sort of person becomes a scientist - what sort of skills do they need?**

**5. Here's another question that I asked you at the beginning of year 9.**

**If you had to go into a job connected with history what job would you choose?**

**If you had to have a job connected with science what job would you choose?**

**6. What have you had in the way of careers education since I saw you at the end of Year 9?**

**7. When you are being taught about careers, what sort of thing do you want to know about?**

**8. Which have you considered doing after your CGSEs?**

**EITHER, PROBE: How did you decide that?**

**OR PROBE: How do you think you will decide what to do?**

Any subjects that you have rejected for after GCSE?

PROBE: Why is that?

**9.** (Refer to list of students with ideas about a career in last interview)

EITHER: Do you still have the same ideas about what you'd like to do as a career?

PROBE: Have you got any information from school or help from teachers to do with that?

OR:- Do you have any ideas about what you want to do as a career?

PROBE: Any thoughts about further into the future?

PROBE: What aspect of school has made you think about that?

**10.** Which are you enjoying best out of English, mathematics and science?

PROBE: Can you explain why?

PROMT: About how much of each syllabus do you think you have covered?

**11.** Which of the subjects do you **now think** should be compulsory for everyone for GCSE.

PROBE: Why is that?

PROMPT: How is that subject useful?

Which ones do you think should **not** be compulsory?

PROBE: Are there any subjects that you personally would drop given the choice? Why is that?

**12.** Which subjects help you in other subjects?

Which of the subjects cross over with each other?

**13.** Which of the subjects do you think are regarded as difficult by the GCSE students in this school?

**14.** Are there any subjects which you like, but which you also find difficult?

PROBE: Are there any subjects where you feel that you have made a lot of progress, but which you have also found difficult?



**15. I'd like to focus on English now.**

**Are the groups set, banded or mixed?**

**What sort of things do you like doing in English?**

**PROBES: Is that a popular activity?**

**Do you think this helps you to improve your English?**

**What have you learnt in English that you thought was important?**

**What have you learnt in English that might help in a future career?**

**16. I'd like to focus on science now.**

**Are the groups set, banded or mixed?**

**What sorts of things do you like doing in science?**

**PROBES: Is that a popular activity?**

**Do you think that this helps you to improve your science?**

**What have you learnt in science that you have thought was important?**

**What have you learnt in science that might help you in a future career?**

**17 (a) Can you think of any particular people (no names please) that you think could continue with English if they wanted to?**

**PROMPT: Boy or girl?**

**PROMPT: What sort of people are they? Are they of any particular type?**

**PROBE: So why do you think they are likely people to carry on with English.**

**(b) Can you think of any particular people that you think could continue with science if they wanted to?**

**PROBE: Boy or girl?**

**PROBE: What sort of people are they? Are they of any particular type?**

**PROBE: So why do you see them as the likely people to carry on with science.**

**Can you think of any particular people that you think could continue with history/geography/humanities if they wanted to?**

**PROMPT: Boy or girl?**

**PROMPT: What sort of people are they? Are they of any particular type?**

PROBE: So why do you see them as the likely people to carry on with history.

## **General**

18. What's on offer in the way of extra-curricular activities? PROMPT: Clubs, after-school activities.

PROBE: What do you do?

19. What news have you heard that has been connected with science over the past few months?

(N.B. The initial reaction to this question is important and can be probed)

PROMPT: Have you heard about?

A Topical subject

(i) Germ warfare/chemical weapons stores in the Gulf.

(ii) Putting John Glen up into space at over 70 years old.

20. When do you go on work experience?

PROBE Are you looking forward to it?

What do you think is the purpose of work experience?

What do you think it is going to be like?

21. Do you have anything that you would like to ask me?

## **INTERVIEW SCHEDULE: Year 11**

Q 1 Tell me about the school's approach to choices about post-16 (after this year).

PROMPT: You could refer to options process, e.g. was it like options? How was it different?

PROBE: Did your subject teachers encourage you to do their subject?

PROBE: Did you get the impression that anyone at school thought that a particular course/A-level might suit you?

**Q 2 Tell me how you chose *your* course/A- levels**

**PROMPT:** Which teachers helped? In what way?

**PROBE :** Who else was involved?

**PROBE:** What other courses/ combinations did you think about?

**Q 3 Tell me about careers education.**

**PROBE:** Did you have an individual careers interview?

**PROBE:** Did your form teacher get involved? subject teacher/friends/family?

**PROMPT:** Did you think about the jobs of anyone in your family? Did you find out about any of them?

**PROBE: :** What did you think of the work experience?

**Q 4 Would you have wanted any other help in choosing your course/A- levels?**

**What about careers?**

**N.B.** In the next section you will raise issues from previous interviews.

**Q 5 Did you think/when did you start thinking**

**about doing sciences or a science post-16**

**If doing one science, what about the others?**

**Did science teachers do any careers work with you? Did they mention any careers in lessons?**

**Q 6 What is science like in school?**

**PROMPT:** What do you do in science?

**PROBE:** Do you think science should continue as a core subject?

**Q 7 Have a look through these jobs. What is your reaction? Can you see yourself doing any of them?**

**N.B.** The subject(s) indicated is (are) necessary to A-level in order to study the courses at university

Environmental risk management (environmental protection)	Chemistry and biology
Veterinary nurse	GCSE including science

Food manufacture, marketing and management	Biology
Food science with European studies	Chemistry
Diagnostic radiography	Physics
Speech therapy	Biology
Mechanical engineering & manufacture	Technology/physics
Biological sciences (pollution control)	Biology and chemistry
Biological sciences (biotechnology)	Biology and chemistry
Photographic science	Physics
Building conservation technology	Chemistry
Forensic measurement	Chemistry
Architectural technology and management	Technology/physics
Food and human nutrition	Biology
Environmental geosciences	Geology/chemistry
Polymer science & Technology	2A-levels including 1 science

Q 8 What would you do to get more people interested in science?

Q 9 How far ahead are you thinking?

Q 10 What do you think you will be doing in ten years time? What do you hope?

## **APPENDIX B**

**N.B. CONTACT ADDRESS AND TELEPHONE NUMBER SUPPLIED**

**September 1996**

**Dear Parent/Carer**

**I am conducting educational research about children's experiences of school subjects.**

**Your child's school has agreed to take part in the study and I would like your permission to approach your child for a series of interviews as part of my research. All children who participate will remain anonymous in the report of the research.**

**Please contact me if you require information that is more detailed. Please complete the form below and return it to your child's form teacher.**

**I would be grateful for your support.**

**Yours faithfully**

**Anna Cleaves MSc. Adv Dip.Ed.**

## **APPENDIX C: Data codes - all interviews**

### **ahead mnly shrt trm**

Future seen in terms of max 1-2years ahead

### **anti coll or school post16**

Student does not want full time education after 16

### **antipathy to subject**

Expresses an antipathy towards a school subject

### **anxiety expressed**

Expresses anxiety about choosing or choices made

### **Automatic to do A-level**

A-levels are the automatic route after GCSE

### **broad choice described A-levels**

Students describes choice of A-level as broad

### **career in mind?**

Does student have a career in mind?

### **careers in mind several**

Students has several, careers in mind

### **Chooses a lighter subj**

A-level subject chosen as third subject described as lighter than other two subjects

#### **1. chooses art and design**

#### **2. chooses GNVQ**

#### **3. chooses mixed A-levels**

#### **4. chooses modern apprenticeship**

#### **5. chooses new subj**

#### **6. chooses non science A levels**

#### **7. chooses science A-levels**

Above codes, 1-7, show the type of choice made during year 11

### **comment school ethos**

Makes a general comment about the school ethos

### **confid in ctrl own choice**

Student indicates confidence in/control of their choices

**criticism of subj teaching**

Student criticizes subject teaching

**curr subj use impctce**

The usefulness or importance of a subject is described

**d science in rel to post16**

Students' views of double science as a preparation for science A-levels

**disappointment aspect choosing**

Student expresses disappointment about an aspect of choosing

**discouraged**

Student feels discouraged from a course of action

**encouraged to pursue subject**

Student has been encouraged to continue subject beyond 16

**expected from school**

Student expectation of school during choice

**factor of future importance**

Student mentions something which will be important to them in the future

**famil validn choi**

Famil members approve/validate choice

**famil suggest choi**

Family members suggest choices

**friends involvement in choice**

Student describes friends' involvement in choice

**gender specific for subjects**

Student shows gender bias in description of people who take certain subjects

**good subject teaching comment**

Student commends subject teaching

**Help with choice described**

The student describes how they have been helped with their choices

**image businessperson**

**image English stud**

**image historian**

**image scientist**

Above. Images of certain professions/students of subjects

**insinuate people diff abils**

The student talks about innate ability in different subjects

**intellectual challenge wanted**

The student is looking for an intellectual challenge

**mathematics one right answer**

Mathematics distinguished as a subject with one right answer

**Never considered science**

Student says they have never considered science

**nurture talent possible**

It is possible to learn how to be good at something

**open minded re choice**

Student says they are open-minded about choice

**opin compuls subjs Yrs 10 and 11**

The student's opinion about compulsory subjects in years 10 and 11

**optns nt crucial career dirctn**

Student does not consider options at 14 to be crucial to career choice

**outside infl choice**

Student describes an influence on choice from outside of school

**Predicted grades infl choice**

Predicted GCSE grades are an influence on choice

**Reflectns abt stertping**

Student reflects on subject/career stereotyping

**rejects GNVQ**

Student rejects GNVQ as possible post-16 choice

**SATS Comment about**

Student makes comment about year 9 SATS

**school has 3 sciences option**

The school offers a 3 sciences option

**school no 3 sciences opt**

The school does not offer a 3 sciences opt

**Science as a school subject**

Student makes comments about science as a school subject

**scientific enterprise**



Student makes comments about science as an enterprise

**Seen as a difficult subject**

A school subject is seen as difficult

**self as scitist pos**

Student projects positive image of himself or herself as potential scientist

**self as scitist neg**

Student projects negative image of himself or herself as potential scientist

**self valid choice**

Student validates/justifies their own choice

**self worthiness**

Student makes a comment about his or her own self worth

**Strong contin infl on choice**

Student describes a strong continuous influence on choice

**subj not int or enj**

Student describes subject as not interesting/enjoyable

**Subject interesting enjoyable**

Student describes subject as interesting/enjoyable

**Subject not useful**

Student describes subject as not useful or cannot say for what subject is useful

**Subject teaching informs choice**

Student describes how subject teaching affects choice

**subjects connected**

Student describes subject connections

**suggestions for improvement**

Student makes a suggestion for improving an aspect of school

**Teacher role in choice**

Teacher has/does not have/is not expected to have a role in choice

**Unexpected Yr 11 choice**

The student makes a choice which could not have been anticipated from interviews in years 10 and 11

**work experience comment**

Student makes a comment about work experience

## Appendix D Data Sampling with Coding

The data selections below were used to illustrate the procedures of grounded theory for transcripts from a single case (student) as described in chapter 4.

The data selections below were used to illustrate the procedures of grounded theory for transcripts from a single case (student) as described in chapter 4. The student is designated NHG1. She achieved 10 GCSEs grades A-C, including CC in double science.

Year/ Stage of Study	Interview Question	Response	Memos	In Vivo Coding	Descriptive Coding
Pre-option year 9	Q10 What subjects would you make compulsory for all pupils at GCSE?	A10 Definitely English and maths. A language, German or Spanish. Science I suppose	Science status compared to maths & English Vague on careers advice	Positive about English and maths	Curr subj use Imptce
	Q11 What have you found out about careers from subject teachers?	A11 Sometimes they mention things like you need a subject to do this job. I can't remember what exactly		Little careers advice	
	Q13 When you are being told about careers, what sort of thing would you like to learn about?	A13 How you have to do GCSE's and A-levels. How you get there because it is a big step. I don't know about college and university and things like that.	Interested to know about next steps. Not enough about careers?	Assume doing A-levels	Disappointment aspect choosing/ Automatic to do A-level/expected from school
	Q19 Have you decided against doing any of your school subjects after you leave school?	A19 Definitely music. I find music so difficult. PE. Not completely decided against anything else	Two subjects out	Open-minded re choice	Open-minded re choice

Year/ Stage Study	Interview Question	Response	Memos	Open Coding	Descriptive Coding
Post - Option year 9	Q1 Which subjects did you take in your SATs tests. What did you think of them?	A1 Well I thought they were quite hard. I thought they would be hard. It is a lot of pressure to revise; there is so much to learn.	Longitudinal dimension about subjects	Positive about English	Subject interesting enjoyable
	PROBE: Which was the easiest?	English was my easiest. Maths and science I wasn't very good at all. We have gone through all the work very well in English.	Positive about English. Science and maths difficult	Science difficult	Seen as difficult subject
	Q4 Does everyone have to do double English? Do you agree with that?	A4 Probably yes. I think we have to do both. I think it should be your own choice really to see what you are better at and what you can do well in. Yes	How many students want more choice?	More/fewer options	Good subject teaching
	Does everyone have to do double science? Do you agree with that?	No, no because it's even harder science. It would be better if we had a choice. Not so much pressure. A21 English, history, PE, sometimes I like biology. I like them in different ways	Choice between what and what?  See year 11. Choice between sciences		Subject interesting enjoyable
	Q21 What subjects do you like?			Wants choice between sciences	Science as a school subject

<b>Year/ Stage of Study</b>	<b>Interview Question</b>	<b>Response</b>	<b>Memos</b>	<b>Open Coding</b>	<b>Descriptive Coding</b>
Year 10	Q2 What subjects might be useful for a future career?	A2 I think English, maths and science because you learn so much in those subjects. They are the basis.	Accepts core subjects	Core subjects accepted	Curr subj use imptce
	Q3 In your lessons do teachers explain about careers connected to the work you do in class?	A3 Sometimes they say this would be a good thing to learn for your exams	Subject teachers, not much on careers	More information wanted about future	Expected from school
	Q7 When you are being taught about careers, what sort of thing do you want to know?	A7 I don't know so much, so I'd like to know what the options are for the next stage.	Still seeking information for next stage	More information wanted about future	Expected from school
	Q8 What have you considered doing after your GCSE's?	A8 I don't really know because there are a lot of things to choose from. I will have to think about all the options.			Open- minded re choice
	Q11 What subject do you now think should be compulsory for everyone for GCSE?	A11 Definitely English I would say and a language. I don't think anything else is important. You should be able to choose	Contradicts Q2, this interview Positive about English throughout	English important	Curr subj use imptce

Year/ Stage Of Study	Interview Question	Response	Memos	Open Coding	Descriptive Coding
Year 11	Q 3 Tell me about careers education	A3 There was lots of time spent on the things you were good at and your hobbies. We filled out forms about ourselves so many times. We learnt how to behave for an interview for work experience and how to write an application letter, but apart from that ..... They talked about GNVQs and apprenticeship in things like plumbing and carpentry. The work experience taught me how monotonous a job can be. I have to do a job where I can use my brain and be an individual, get some enjoyment out of it.	Seems resentful. How useful is this considered to be?  Wants more than this Waste of her time Learnt from work experience	<b>Self evaluation activities</b>  Preparation for work experience  Careers education	Disappointment aspect of choice  Work experience comment  Work experience comment/Intellectual challenge wanted
	Q8 What would you do to get more people interested in science?	A8 Make it more about ordinary things. Like we did about fibre optics and we saw this video they use in medicine with a camera on the end. I know we have to do a lot of theory, but we shouldn't save it up for the end  English, psychology, French	Suggestions. Science more in context  Criticizes curriculum delivery  English and language	Science as a school subject  Suggestions for improvement  Subject teaching informs choice	Science as a school subject  Suggestions for improvement  Subject teaching informs choice  Chooses non science A-levels
	A-level choices			Continuous interest English and French	

**Appendix E – Example of Trajectory Identification  
Theme ‘Certainty about choice for student NHG1’**

<b>Year/ Stage of Study</b>	<b>Interview Question</b>	<b>Response</b>	<b>Descriptive code</b>	<b>Longitudinal pattern</b>
Pre-option Year 9	Q13 When you are being told about careers, what sort of thing would you like to learn about?	A13 How you have to do GCSE's and A-levels. How you get there because it is a big step	{Ahead mainly short term {Automatic to do A-level	-
	Q5 What ideas do you have about what you would like to do when you leave school?	A5 I've got like different things. Like a doctor is one and then design and fashion. That's the main things.	Careers in mind several	
Post-option Year 9	Q7 When you are being taught about careers, what sort of thing do you want to know about?	A7 I don't know much, so I'd like to know what options are for the next stage	{Ahead mainly short term {Automatic to do A-level	-
	Q19 Have you decided against taking any of your school subjects after you leave school?	A19 Music. I find music so difficult. PE. Not completely decided against anything else	Open minded re-choice	
	Q20 Have you any ideas about what you'd like to do after you leave school?	A20 Not really. I keep changing my mind so often	Open minded re-choice	
Year 10	Q7 When you are being taught about careers, what	A7 I don't know much, so I'd like to know what the options	Ahead mainly short term	

	sort of things do you want to know about?  Q8 What have you thought about doing after your GCSE's?	are for the next stage  A8 I don't really know because there are a lot of things to choose from I will have to think about all the options	<b>Career in mind?</b>  <b>Open minded re-choice</b>	
Year 11	Q. How far ahead are you thinking?	a. To getting my GCSE's done	<b>Ahead mainly short term</b>	Consistent
	Q. Tell me how you chose your course/A-level	A. My parents said that English and languages were good A-levels. I like history though	<b>{Automatic to do A-level {Open minded re-choice</b>	Consistent  Narrower than year 9 and 10  Open minded within arts domain
	Q. Did you think about doing sciences or a science post-16?	A. No, I can't see myself doing science at A-level. My science is just not strong enough		
	Q. Would you have wanted any other help in choosing you're a-levels?	A. I don't know what I want to do. I don't care about careers.	<b>Career in mind?</b>	No specific career seriously considered

Application of the descriptive codes in code cluster 'Certainty about post-16 choice' to student designated NHG1.  
Student NHG1 was found to have a 'Funneling Identifier' trajectory according to the typology established in chapters 5 and 6.

**Theme 'Certainty about choice' for student BOG2**

<b>Year/ Stage of Study</b>	<b>Interview Question</b>	<b>Response</b>	<b>Descriptive code</b>	<b>Longitudinal pattern</b>
Pre-option Year 9	Q4 What ideas do you have about what you would like to do when you leave school?	A4 I don't know. I put something financial on the careers form. I do like maths	<b>Career in mind?</b>	-
Post-option Year 9	Q10 What help did you get in choosing your options?	A10 My dad says it is good to do languages because there are a lot of good courses you can do at university	<b>Automatic to do A-level</b>	Business/ accountancy mentioned
	Q20 Have you any ideas about what you would like to do when you leave school?	A20 Something like accountancy and using languages	<b>Career in mind?</b>	
	Q8 What subject would you not take if you had a free choice?	Q8 None. My subjects are all all right	<b>Open minded re-choice</b>	
	Q19 Have you decided against taking any of your school subjects once you leave school?	A19 Art. It seems there are not so many jobs open that need art	<b>Open minded re-choice</b>	
Year 10	Q8 What have you considered doing after your GCSE's? Q7 When you are being taught about careers, what sort of things do you want to know about?	A8 Going on to do A-levels for definite if I get good enough grades. Possibly, go to university. Maybe business studies.	<b>Automatic to do A-level</b>	Business studies mentioned
		A.7. Qualifications. What the jobs are like in the areas that	<b>Career in mind?</b>	



	<p>Q6 What have you had in the way of careers education since I saw you at the end of year 9?</p> <p>Q9 Do you still have the same idea about what you'd like to do as a career?</p> <p>Any thoughts further into the future?</p>	<p>interest you. I like the idea of office work, so I would like to know the different types</p> <p>A6. The CACP came out with some jobs I might like to do. Quite a lot of 'arty' jobs, architect, designer</p> <p>A9 I only thought of accounting because someone told e I was good at maths, so maybe I can go into something with maths. I had thought of going into a bank or doing accountancy</p>	<p><b>Career in mind-several</b></p> <p><b>Career in mind-several</b></p> <p><b>Career in mind?</b></p>	<p>Mentions similar general area of careers</p>
Year 11	<p>Q How far ahead are you thinking?</p> <p>Q. Tell me how you chose your A-levels</p> <p>Q. Have you looked up jobs with languages?</p> <p>What about accountancy?</p>	<p>A. To next week. Really I just want to concentrate on my GCSE's</p> <p>A. I enjoy maths so I thought it could lead me to something financial</p> <p>I thought about economics or business studies</p> <p>A. No, I haven't thought about doing languages</p> <p>I have looked at a few financial jobs</p>	<p><b>Ahead mainly short term</b></p> <p><b>Career in mind?</b></p>	<p>Non-specific ideas related to business environment throughout</p>

Application of the descriptive codes in code cluster 'Certainty about post-16 choice' to the student designated BO G2  
 Student BOG2 was found to have a 'partially resolved' trajectory according to the typology established in chapters 5 and 6.